

**TECHNOLOGICAL STUDIES AND SHELF LIFE
OF LAL PERA PREPARED FROM
DIFFERENT TYPES OF MILK**

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By :

RAJESH SINGH

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Dr. B.L. Khan
Professor and Head

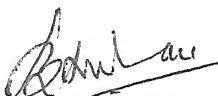


DEPTT. OF A.H. AND DAIRYING
CHANDRA SHEKHAR AZAD UNIVERSITY
OF AGRICULTURE AND TECHNOLOGY,
KANPUR-208002, U.P. (INDIA)

Date:.....

CERTIFICATE

This is to certify that the thesis entitled "**TECHNOLOGICAL STUDIES AND SHELF LIFE OF LAL PERA PREPARED FROM DIFFERENT TYPES OF MILK:** submitted in partial fulfilment of the requirements for the degree of **DOCTOR OF PHILOSOPHY** in **DAIRY SCIENCE** of the Bundelkhand University, Jhansi, U.P. India, in a record of bona fide research work carried out by Mr. Rajesh Singh under my supervision. The Thesis embodies the work of the candidate himself, it has not been submitted for any other degree of any university here or abroad.


(Dr. B.L. Khan)

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INTRODUCTION

INTRODUCTION

India is a country of vast culture heritage. A major parts of population live in villages distributed all over the country having different climatic conditions. Milk is the most important source of the energy in our diet and milk is known as a balanced food. Most of the milk is being produced in villages by individual producers. On account of lack of transport facilities, a major portion of milk is being converted in to various milk products.

The keeping quality of milk is very poor because all suitable conditions are available in milk for the development of the micro-organisms. It is a main problem in India, that no facilities are mentioned at very place to check this problem. Therefore, a large amount of liquid milk is converted in to sweet meat for the long time keeping quality.

India has first position in world in case of milk production, while U.S.A. stands second .The milk production in india during 2000-2001 was 88.6 million tonnes and per capita availability was 231.44 gm per day.

Khoa is an Indigenous milk product of considerable, economic and nutritional importance to the people of this country. This is par-

tially desiccated milk product prepared by rapid evaporation of moisture, until the total solids content of the product reached to 75 percent. It is extensively used in a variety of sweet and salted preparations. Its consumption is increased to manifold in the festivals and at special occasions.

According to the PFA rules (1976) Khoa is the product obtained from cow or buffalo (goat or sheep) milk or a combination thereof by rapid drying. The milk fat content should not be less than 20% of the finished product.

In India milk production is mostly rural in nature while the consumption is urban. All the milk product in remote country, there having no suitable means of transport, can not reach to the many consumers, hence it becomes surplus, thus only alternative each producer is to conserve as many constituents of milk as possible, a or more alike to that of original milk and that is the Khoa making.

Khoa constitutes one of the two chief bases (the other being chhana) for preparing indigenous sweets. The production of khoa in India (1966) was estimated to be about 4.9% of total dairy production and 8.7% of the milk used for manufacture of milk products. Today the total khoa production may be estimated at over 300 million Kg, valued at rupees 300 crores at the present rates. The preparation and use of khoa are confined mostly to the northern and western region of the country. By far the largest amount is contributed by U.P., where nearly 36% of the country's total khoa production takes place.

Khoa is a condensed source of all the nutrients. Its nutritional

significance is by virtue of its high fat content and carbohydrates, that are essential for the successful growth and development of the body. It is 4-6 times more nutritious than milk in terms of unit weight and calorific value. It is an enriched source of energy and its calorific value is ranges between 1800 to 2337 calories per pound (warner, 1953). It has higher content of proteins, like tryptophane and lysine, which are not commonly found in vegetable protein. It is a good source of unsaturated fatty acids of animal origin. Minerals like calcium and phosphorus, fat soluble vitamins A, D, E, and K are found in abundance, Six ounce of khoa is supposed to be sufficient to satisfy an adult's mineral requirement. Like-wise Khoa, the pera is the source of all above nutrients.

Usually Khoa used as a raw material for pera making, may be kept well for 48 hours under ordinary conditions of handling and storage followed by deterioration due to the microbial action (Davis, 1940). Rapid spoilage of khoa is attributed to the contamination of moulds from external sources. Visible signs of deterioration and marked breakdown of the constituents of Khoa have been observed by Ahmad & Ranganathan (1967). It was also noted that deterioration was very rapid at higher temperature due to microbial action, General appearance and organoleptic qualities of Khoa, are also affecte to a great extent. The suger added in khoa for pera making acts as preservative in increasing keeping quality of pera as compared to khoa.

Both pathogenic and non-pathogenic micro-organism are found in khoa and pera. It serves a suitable medium for growth and transmis-

sion of pathogenic micro organism, thereby it is a potential source of danger to the public health, if not properly handled. Bacteria enter into Khoa based pera from two sources, i.e. from raw milk and from contamination during manufacturing and handling processes. Since milk is treated to a high temperature during Khoa making, most of the bacteria present in raw milk are destroyed except few that are spore formers or heat resistant. Therefore, the chief source of micro organism in Khoa and pera is the post-preparation contamination. These sources of contamination are the utensils, sugar content, store rooms, persons coming in contact of Khoa and pera making and handling and packing practices. Undoubtedly pera prepared from Khoa is an ideal nutrient and economic milk product for human consumption but at the same time it may be harmful also, if not properly prepared and handled because it provides the same nutrition for the growth of micro-organism. Therefore the microbiological quality of pera is of importance to prolong the life of Khoa based pera as well as to save the lives of consumers against pathogens.

Lal pera Khoa based sweet-meat which is brown to light brown in colour with firm body and semi smooth texture. It is prepared by using technique that are suitable for small scale preparation. Khoa and sugar mixed in shallow pan with concomitant heating and stirring to obtain dough. The dough is cooled down, then lal pera is made either by palm of both hand or by mould. Two types of pera are prepared in the markets.

1. Khoa Pera

2. Doodh Pera

It may be generally stated that food to be really nutritious must contain the protein essential for body building, fat to supply heat (energy), sugar essentially a heat energy producer, mineral matter for growing tissues of the body and for the normal metabolism and vitamins for normal growth and physiological functions. All these essential are found in milk and also in Khoa based lal Pera. Therefore Khoa as well as lal pera may be described as an ideal food, if properly prepared and handled.

During preparation of lal pera, as milk is subjected to high heat treatment for Khoa making, majority of micro organism present in it are destroyed. However, subsequent contamination may take place due to addition of contaminated sugar, improper handling of product and unhygienic surroundings in which it is prepared. It is very easy to transport the lal pera up to any distance, but on the other hand if it is sufficiently moist then it will permit the growth of micro-organisms, moulds and give the visible growth on its surface within few days of storage at room temperature. Usually Khoa used as a raw material for lal pera making, may be kept well for 48 hours.

Resultantly, the quality of the product vary from one producer to another. Considering the popularity of the product and aforesaid facts, the present investigation has been taken up with the following objectives :

5. Objectives :

1. To find out the type of milk most suitable for Lal pera making.
2. To ascertain the effect of different sugar levels on the quality of Lal Pera.
3. To ascertain effect of different packaging materials on the quality of Lal Pera.
4. To ascertain shelf life of Lal Pera stored at room temperature for different periods of time.
5. To assess physico-chemical and microbiological qualities of Lal Pera.
6. To assess the cost of production and profits of Lal pera making.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Lal pera is a Khoa based sweet. Literature related to method of preparation, physico-chemical characteristics and quality of Lal pera and Khoa, base product of Lal Pera has been reviewed which is devided in two sections. In first section literature concerning Khoa is reviewed while second section is devoted to literature on Lal pera.

1. Khoa

2. Pera

(1) KHOA :

(A) METHOD OF KHOA PREPARATION :

De (1980) reported existing trade practices for Khoa making normally 2 to 3 kgs or more milk was taken per batch and boiled in karahi over a brisk, non-smoky fire. The milk was stirred vigorously and constantly with a circular motion by a khunti. During this operation all parts of the pan with which the milk came in contact were lightly scrapped to prevent the milk from scorching. Constant evaporation of moisture occurred and the milk thickened progressively. So far the process was similar to kheer making. However, no sugar was added and milk dehydration continued. At a certain concentration (Cow milk

2.8 times and buffalo milk 2.5 times & toned milk 3.0 times) heat coagulation of milk proteins began and the concentrate became progressively 'Insoluble' in water. This stage was marked by an abrupt change in colour. The heating was continued with greater control thereafter, and speed of stirring cum scrapping was increased. Soon the viscous mass reached a semi-soild/pasty consistency and began to dry-up. Very close attention was paid to the last stage. The final product was ready when it showed signs of leaving the bottom and sides of the karahi and sticking together. The Khoa pat was invariably made after removing the pan from the fire and working the contents up and down in to a single compact mass. It was generally marketed in different sizes and shapes.

B. IMPROVED METHOD FOR KHOA MAKING :

De (1980) suggested improved method for Khoa making. This involved consideration of equipments, condition of dehydration and quality of milk.

(I) EQUIPMENTS :

The karahi and open fire combination was conveniently substituted by a stainless steel jacketed pan/kettle. In the jacket of which either steam or water was circulated as required. This not only provided greater control of the dehydration process, but also an on-smoky, heating medium. The standard iron rod, flattened at one end for stirring cum scrapping was normally used.

(II) DEHYDRATION CONDITION :

The physico-chemical quality of Khoa was influenced by the con-

dition of dehydration which included temperature of dehydration and amount of milk taken per batch for dehydration.

In order to obtain a desirable body and texture in Khoa, the milk was kept boiling till it assumed a pasty consistency and then the temperature was lowered to $85 + 33^{\circ}\text{C}$ till the pat formation stage. During the entire dehydration process, the milk was stirred at 96-100 r.p.m. The dehydration was stopped when the pan content started leaving the pan surface and showed a tendency to stick together. The amount of milk handled per batch varied between $1/4$ to $1/5^{\text{th}}$ of the total capacity of the pan used.

(III) CHANGES DURING KHOA PREPARATION :

The methods of Khoa preparation and changes during its preparation have been discussed by several workers.

Davis (1940) pointed out the physico-chemical reactions which take place in various constituents of milk during the indigenous method of Khoa making. He reported that Khoa is whole milk product from which moisture has been evaporated up to 25-30% and total solids increased up to 70-75%. He also mentioned a rapid deterioration of albumin, globulin and destruction of other colloids in early heating which was accelerated by frothing and incorporation of air by means of stirring. For the process there was no evidence either of churning or the 'oiling off' of the butter fat because vigorous stirring of hot milk had homogenous effect.

Rangappa (1948) observed that boiling of milk for 10 minutes in an open vessel with continuous stirring, as is a common practice in

India, caused a variable reduction in Volume, loss of 0.28 per cent total solids, 0.1 percent fat and 0.14 percent of lactose, and a reduction of bacterial count.

De and Ray (1952) have pointed out the influence of dehydration condition and types of milk on production of Khoa. They have reported that the ratio of S.N.F./Fat in milk influenced both the yield and total solids in the final product of Khoa. They also reported that boiling the milk for Khoa making and then lowering the temperature (180-190⁰F) at the time of pat formation with continuous stirring at a speed of 150-160 r.p.m. resulted in to good Khoa character.

Warner (1953) while discussing the method of Khoa preparation, reported that sometimes skimmed milk could also be used for the purpose, but the product had firmer structure. Heating duration depended upon the quantity of milk and the rate of heat exchange.

De and Srinivas (1967) studied the utilization of aged roller dried skimmed milk powder with butter or ghee for Khoa making and reported that by using 100 gms butter, 200 grams SMP and 1000 grams water, Khoa could be prepared without fat leakage provided vigorous stirring and scrapping is done during heating khoa, thus product had normal flavour but slightly caramalized colour. The average composition of Khoa prepared under standardization laboratory condition had moisture 25.6 percent, fat 24.01 percent and S.N.F. 50.3 percent.

Singh (1970) observed for most economical and efficient production of Khoa with drum heater: (a) the optimum feed rate should be 1.0 kg milk per min. in the drum heater : (b) a steam pressure of 1.4 kg/

cm^2 in the first pan and 0.7 kg/cm^2 in the second pan is desirable and (c) production run of 6-8 hours duration should be carried out. The khoa obtained by this equipment invariably had a moisture content ranging from 33.3 to 37.3 percent.

Patel (1976) standardized method for the manufacture of Khoa powder, consisting of (a) standardizing buffalo milk to 5% fat (9.8% S.N.F.) straining through a muslin cloth ; (b) preheating to $65-70^0\text{C}$ and homogenizing at $2500 \pm 200 \text{ psi}^2$, (c) making Khoa up to concentrate stage, (d) mixing water to make slurry with 16.18 % solids (e) adding sodium citrate @ 0.5 % of Khoa solids, (f) heating to 600^0C passing through micropulverizer (g) roller drying with steam pressure of $4.17 \pm 0.35 \text{ kg cm}^2$ ($60 \pm 5 \text{ psi}$) and jar packing of the dried products.

Garg et al. (1989) investigated post manufacture of Khoa with respect to the textural changes in the product. Instron hardness, guminess, chewiness and adhesivness of Khoa particularly of low moisture type, registered a difinite rise during holding 30^0C for 72 hrs. Cohesiveness and springiness, however, remained largely unaffected.

Dynamic viscosity of the product followed a similar trend as hardness. The moisture content remaining unaltered during holding, the observed changes in texture of Khoa were considered attributable to orobable changes in the physical status of the product constituents

Adhikari et al. (1994) Studied the interrelationships between texture composition and microstructure of Khoa from buffalo milk. Instron hardness, guminess and chewiness were negatively correlated with

moisture and fat contents, but positively correlated with protein, lactose, added carbohydrates, ash and calcium contents of Khoa.

(C) QUALITY OF KHOA :

(1) PHYSICAL QUALITY :

Chetak and Bandopadhyaya (1989) analysed 57 samples of khoa and reported physical quality of Khoa as :

Colour :	Pale yellow	(14)
	White	(22)
	Grey	(11)
Appearence :	Moist surface	(43)
	Dry surface	(14)
	Hard granular	(5)
	Hard and smooth	(26)
	Soft and Smooth	(13)
	Soft granular	(11)
Flavour :	Normal	(52)
	Flat	(3)
	Rancid	(2)

(2) CHEMICAL QUALITY :

Composition of Khoa has been reported by various scientists under various conditions :

Iyer et al. (1940) reported the chemical composition of Khoa. They found that fat percent of Khoa and fat percent of milk used for making showed a direct relationship. They also found moisture 25%, protein 32.92%, lactose 36.80%, fat 25.60% and ash 4.30% in Khoa

prepared from mixed milk. The Khoa prepared from pure cow milk was found to contain moisture 26.0 to 40.7 %, protein 24.8-29.0 %, lactose 24.3-40.8% and ash 4.1 to 5.2 %, while buffalo milk Khoa was found to contain moisture 26.1 %, protein 22.4 %, lactose 30.9% fat 37.3 % and ash 3.7 %. These workers also suggested the standards for the composition of Khoa as protein 24.5%, Lactose 20.0 % fat 27.0 % and ash 4.0 percent.

Bhat et al. (1948) carried out on "chemical and microbiological studies of Khoa", and reported on an average the chemical composition of Khoa as moisture 19.69 %, total solids 80.31 % protein 26.68 %, fat 29.72 %, lactose 20.24 % and ash 3.67 percent.

De and Ray (1952) reported an average composition of Khoa as total solids 73.0 %, moisture 27.0%, fat 33.0 %, protein 20.0 %, lactose 24.0 % and ash 4.0 percent.

Balasubramanium and Basu (1955) gave detailed composition of Khoa as moisture 25.2 %, protein 20.1 %, total solids 74.8 %, lactose 24.9%, fat 25.9 %, ash 4 %, calcium 965 mgs/100 grams of Khoa, phosphorus 6.13 mgs/100 gms of khoa, vitamin A 497 micrograms, riboflavin 406 micrograms, folic acid 360 micrograms and vitamin C 45.6 micrograms per 100 gms of Khoa.

Ananta Krishan and Srinivasan (1964) reported the average composition of Khoa prepared from cow milk as moisture 25.6 %, ash 3.7 % and that from buffalo milk, moisture 19.3 %, fat 3.1 %, protein 17.8 %, lactose 22.1 % and ash 3.7 percent.

De and Srinivas (1967) studied the average composition of

Khoa prepared under standardized laboratory conditions and reported moisture 25.6%, fat 24.7 % and S.N.F. 50.3 percent.

Dasture and Lakhani (1971) found that Khoa contained moisture 25.8 %, fat 27.2%, protein 19.5 % and ash 3.36 percent.

Ramjan and Rahman (1973) reported fresh Khoa containing 23.4 %, fat 36.2 %, S.N.F. and 40.40 % moisture.

Ghodekar et al. (1974) analysed the market samples of Khoa and reported the composition of Khoa as fat 27.04 %, protein 18.99 %, Lactose 28.80 %, total solids 75.91% and ash 3.70 percent.

Zariwala et al reported the composition as follows.

Year	No. of samples	Av. moisture (%)	Av. fat (%)	Av. lactose (%)
1966	38	25.56	25.80	16.32
1969	136	28.40	22.40	19.25
1970	201	29.11	28.44	17.38
1971	176	26.89	24.92	17.74
Total	551	28.13	27.14	17.67
		± 2.39	± 3.12	± 1.80

Sharma and Zariwala (1978) reported the composition of khoa as moisture 9.9-44.8 %, fat 12.5-36.0 %, protein 19.8-23.3 % and lactose 9.88-29.0 percent.

Rajorhia and Srinivasan (1979) reviewed the chemical composition of Khoa reported by various workers. There was considerable variation in the chemical quality of Khoa. They reported an aver-

age composition of Khoa as total solids 75.91 %, moisture 24.09 %, fat 27.04 %, protein 18.99 %, lactose 29.09 %, and ash 3.70 percent.

De (1980) analysed laboratory made Khoa for chemical composition from cow and buffalo milk. The values were found to be moisture 25.6 and 19.2 %, fat 25.7 and 37.1 %, protein 19.2 and 17.8 % lactose 25.5 and 22.1 % and ash 3.8 and 3.6 percent, respectively.

Indian Standard Institution (1980) prescribed that there should be fat 37 %, ash 6 % and total solids 65 % of Khoa.

Narian and Singh (1981) collected Khoa samples from different zones of varansi (U.P.) and analysed for chemical composition and compared with that of laboratory made Khoa from cow and buffalo milk. The value for market Khoa were found to be T.S. 68.65%, moisture 2.35%, fat 37.24%, protein 24.76 %, lactose 33.46 % and ash 4.56 percent. For cow milk Khoa the value were found to be total solids 76.85%, moisture 23.15%, fat 34.14 %, protein 23.14 % lactose 35.96 % and ash 4.94 % and for buffalo milk Khoa, the values were total solids 74.98%, moisture 25.02 %, fat 39.44% protein 23.00 % lactose 33.26 % and ash 4.20 percent.

Thompson and De (1981) prepared Khoa powder from cow and buffalo milks, analysed for their chemical composition and reported moisture 3.0%, and 2.9 %, fat 31.8 % and 33.9 %, protein 24.1 % and 24.0 %, lactose 31.0 % and 30.9 % and ash 4.9 % and 5.3 % for cow and buffalo milk khoa powder respectively.

Kumar and Srinivasan (1985) studied fresh buffalo milk Khoa in terms of moisture 22.34%, total solids 77.66 % , fat 17.73 %, ash

3.71 % and lactose 27.70 percent.

Nasir et al. (1987) studied the composition of fresh market Khoa and found lactose 16.0 % and true lactose 15.8 percent.

Ranganathan and Rajorhia (1989) Repotes that free fat content in khoa increased with the increase in fat level irrespective of the kind of milk. Free fat content in buffalo milk Khoa was higher than obtainable from cow milk Khoa at all fat levels. Homogenization of milk reduced the free fat in Khoa samples to about one half free fat content increased with increasing total solids in Khoa. Addition of 20 - 80 glycerol monisterate and sodium citrate separately @ 0.1 % by weight of milk prior to Khoa making reduced the free fat in Khoa by about 9-14 percent.

Sharma et al. (1990) found that quality is influnced by various intrinsic and processing parameters. Increasing the fat content improved the acceptability for samples prepared from milk and having fat ; S.N.F. ratios of 0.316, 0.549 or 0.659, for other fat S.N.F. ratios , the acceptability was percentage used. Similarly an increase in the holding period (for the period studied) led to a greater acceptiblility of the product, in spite of the fact that the colour was seen to shift slightly towards brown. The other two factors studied. homogenization and citric acid addition were seen to reduce the colour development. At the same time, however, there was a poor acceptablility of these Khoa samples. from the studies conducted on the manufacture from milk having fat S.N.F.ratios of 0.549-0.659 with a holding at $101-130^0\text{C}$ for 10-12 minutes without using additives like citric acid and/ or homgenization.

Homgenization leads to a sticky product and addition of citric acid at levels higher than 0.02 % result in a sour product. which is undesirable in Khoa.

Prajapati et al. (1991) reported that Khoa having 65% total solids (TS) and 22% fat prepared from either fresh buffalo milk standardaized to 50% fat (control,c) or concentrated buffalo milk 40% Ts (C) and 50% TS (C) was kneaded manually with simultaneous mixing of 10% sugar (coarse grade) for dough preparation. No other additive were used during dough making. The total solid content of dough were adjusted to $60 \pm 2\%$ to ensure uniform frying without desintegration of balls.

LAL PERA :

A. METHOD OF LAL PERA PREPARATION :

Freshely made Lal Khoa (225 gm) was broken in to bits, 75 gms suger (preferably ground) was mixed into it. Contents were put into a Karahi and cooked over a very slow non-smoky fire, stirring with a khunti, crushed cardamam, if desired was added when mixture was ready to form balls when tested. Contents were then poured into a tray and left to cool and set. This Lal Pera was ready to cut in to desired size and shape to serve (De, 1980).

Lal Pera is generally prepared by mixing Khoa and suger in the ratio of 3:1. The Khoa suger mix is heated on a gentle fire till the mixture forms firm balls; and the colour of mix is changed in to red colour. The pan is removed from the fire and nuts and flavouring substance are added. if desired the contents are mixed throughy and made

in to balls of 15-20 grams size by rolling between the palms after applying a little ghee to avoid sticking.

The product may also be prepared in to different moulds. Some traders also use permitted colours to Lal Pera. Lal Pera is usually packed in paper board cartons having parchment paper liner or grease proof paper liner and sale through confectionery shops. Lal Pera is light red in colour. Kesar (Saffron) pera is one of the preffered pera in which saffron is mixed for added flavor and colour (Dairy India, 1992).

Parihar (1993) reported that maximum yield 26.91 % from buffalo milk Khoa and lowest 20.86 % from toned milk Khoa and an overall highest yield from buffalo milk with 45 % suger. Overall maximum body and texture score from buffalo milk khoa having 35% sugar, lowest flavour score in toned milk Khoa, maximum colour and appearance score prepared from buffalo milk Khoa and lowest score from taoned milk Khoa, overall maximum score from buffalo milk 35% sugar, highest sweetness score from buffalo milk Khoa and lowest score from cow milk Khoa, overall maximum score of sweetness from buffalo milk Khoa having 35% sugar, highest overall organoleptic score from buffalo milk Khoa and lowest from toned milk Khoa. Overall maximum score of organoleptic quality from buffalo milk Khoa with 35% sugar.

QUALITY OF LAL PERA :

(1) CHEMICAL QUALITY :

Dwarikanath and Srikanta (1977) reported that Duh Pera should obtain total solids 88.7% and sucrose 59.4% percent.

Sharma and Zariwala (1978) reported the composition of

pera range of the total solids 85.8-95.8 %, fat 7.0-25.0%, protein 1.2-2.1%, lactose 4.0-18.6% and sucrose 13.2-61.8 percent.

Garg et al. (1984) reported chemical composition of pera on the basis of samples analysed after collecting from Hissar market as total solids 95.01%, protein 13.77% and sugar 37.50 percent.

Pal and Gupta (1987) reported the composition of laboratory made Pera as total solids 75.00% and fat 26.00 percent.

Parihar (1993) reported chemical characteristics in Pera as maximum total solids content 87.35% in cow milk Khoa, minimum 85.00% from buffalo milk Khoa, overall highest total solids content from cow milk Khoa having 45% sugar, maximum protein content 15.54% from cow milk Khoa and lowest content 14.25% from buffalo milk Khoa, overall maximum protein from cow milk Khoa, having 25% sugar, maximum lactose content 24.02% from toned milk Khoa, lowest 18.11% made from buffalo milk Khoa, overall maximum lactose content made from toned milk Khoa having 25% sugar, maximum fat content 21.71% from buffalo milk Khoa and the lowest 14.98% from toned milk Khoa with 25% sugar maximum sucrose content 27.58% from toned milk Khoa and minimum content 26.93% made from buffalo milk Khoa, overall maximum sucrose content from toned milk Khoa with 45% sugar, maximum ash content 3.25% made from toned milk Khoa and lowest 2.93% from buffalo milk Khoa. overall highest ash content from toned milk Khoa having 25% sugar level.

MICROBIOLOGICAL QUALITY :

Bhat et al. (1948) reported that plate count of 5 samples ranged

from 1900000 to 56820000/gm with an average of 33664000/gm in the khoa of Bombay market . The plates were incubated at room tempareture (28-39⁰c) and identified for species of moulds namely green, blue coloured Aspergillus spp., a dark green panicillium spp. and black pacytrim. Two species of Actinomycetes namely Actinomyces rutgerensis and varient of this were isolatedfrom Khoa.

Naidu and Ranganathan (1965) examined 35 samplesof Khoa collected from different Halwai's in Karnal. The total plate count ranged from 1300 to 1500000/gm and coliform were missing which indicated post processing contamination, mainly through handling, and the yeasts and moulds count ranged from 50 to 1000/gm.

Ghodekar (1969) observed that market samples of Khoa scoring good (organoleptically) contained minimum bacterial count of 150 million/gm. This was the minimum bacterial count as compared to other milk products containing sweetener.

Sharma et al. (1969) analysed Agra Khoa samples and reported the range of coliforms 1.4×10^4 to 6.5×10^5 /gm and yeasts and moulds count 6.5×10^3 to $8.0 - 7.8 \times 10^3$ /gm.

Kumar et al. (1975) analysed Khoa samples and reported the range of standard plate count as 8×10^5 - 2.1×10^4 gm and yeasts and mould count as 10-30/gm.

Ghodekar et al. (1980) reported yeast and moulds in Khoa samples ranged between 30 and 6500/gm. *Saccharomyces* was the main yeasts followed by *Candia* and *Rhodotorula* , while *Penicicullium*, *Aspergillus*, *Geotricum*, *Mucor*, *Syncephalastrum*, *Fusarium*, *Rizopus*

and Cladosporium were found among moulds.

Indian Standarded Institutuin (1980) prescribed that there should be 50 and 90/gm yeast and moulds and coliforms count of Khoa respectively.

Agrawal and srinivasan (1982) reported standard plate count as 2.5×10^6 to 3.1×10^8 /gm of Khoa samples collected from Bangalore market.

Prajapati et al. (1986) reported that cow milk made Khoa mixed with 30, 40 and 50% sugar and stored for 0 and 6 days resulted in total count of (13.74×10^3 , 8.14×10^3 and 7.29×10^3 /gm) and (12.99×10^3 , 12.10×10^3 and 16.87×10^3 /gm), respectively. Yeasts and moulds was found to be (20, 28.33 and 26.77/gm) and (28.33, 55.00 and 38.33/gm respectively.

Rao et al. (1986) reported on the basis of analysis of 36 cases of Khoa that 18 samples contained Enterococci. The enterococci ranged from 66 to 960/gm of Khoa and the average count was 219/gm of Khoa.

Gautam et al. (1987) found average number of standard plate count to be 51220, yeasts 5 and moulds 41/gm (the average number of different moulds in Khoa was Aspergillus 32, Alternaria 7, Mucor 2/gm.

Rajmany et al (1989) found that total bacteria in Khoa ranged from 103×10^7 to 300×10^7 with an average of 235.9×10^7 /gm.

KEEPING QUALITY :

Davis (1940) pointed out that deterioration of Khoa is caused

by bacteria and moulds during its storage.

De and Ray (1953) stated that the addition of sugar during preparation of Khoa might have significant effect on reduction of activity of water.

Naidu et al. (1965) studied the keeping quality of Khoa by storing samples for varying periods at room temperature. It was observed that the product rapidly deteriorated depending upon the period of storage, and the number of organism progressively increased during storage. Mouldy growth was clearly noticeable on the surface and sides of the samples stored for 72 hours. The product became soft and exhibited a sour flavour and flat taste due to an increase in number of lactic acid formers and proteolytic organism.

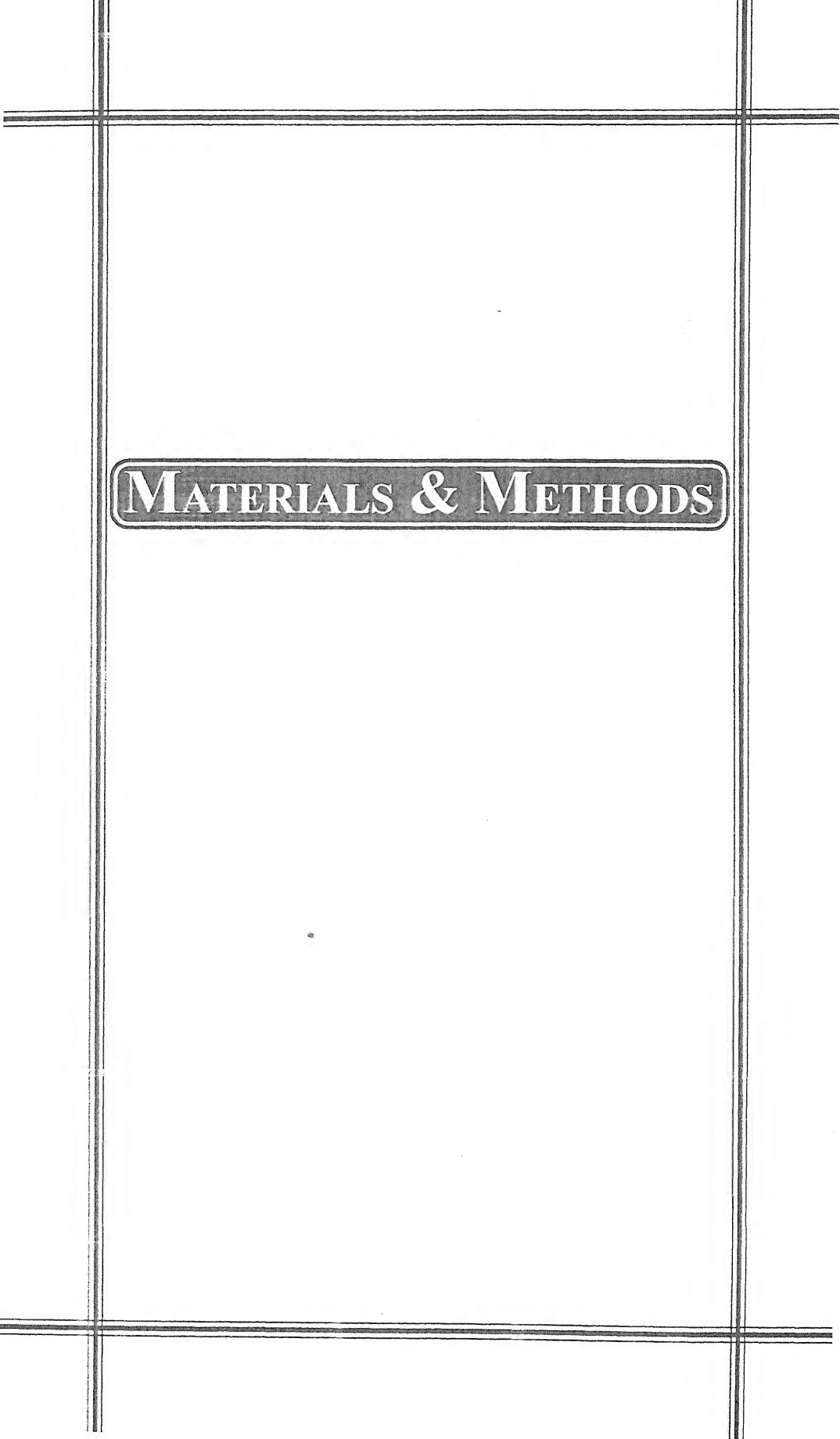
Kumar (1974) studied Khoa sample packed in Parchament paper and Polythene, it was observed that the sample were acceptable up to 5 days at 37^0c and up to 14 days at $8 + 1^0\text{c}$.

Deshmukh et al. (1977) reported that is keeping quality increased with increasing T.S. content. The shelf life of Khoa containing 70, 80 and 90% T.S. was respectively 4, 6 and 9 days at 30^0c , 7, 8 and 15 days at 22^0c and 35, 40 and 60 days at 5^0c keeping quality was more closely related to yeasts and moulds count than bacterial count.

Jha et al. (1977) studied Khoa containing approx. 70% T.S. packed in sterille polythene bags and stored at 5^0c . The shelf life of Khoa could be increased up to 10-12 days at 30^0c and 40 days at 5^0c by adding potassium sorbate. The keeping quality of Khoa was related to microbiological and chemical changes.

Ghodekar and Dudani (1982) inoculated pathogenic strains of *E. coli* in Khoa stored at 37⁰c and found that organism multiplied rapidly in the product and remained alive for a longer period i.e., up to more than 22 days.

Prajapati et al. (1986) studied shelf life of Khoa and reported that the shelf life of control Khoa was found to be 3-4 days, while 30, 40 and 50 percent sugar added samples showed 9-10, 12-14 and 15-17 days, respectivily.



MATERIALS & METHODS

MATERIALS AND METHODS

The present investigation entitled "Technological studies and shelf life of Lal Pera prepared from different types of milk", were carried out in the Department of Animal Husbandry and Dairying, Chandra Shekhar University of Agriculture and Technology, Kanpur and B.N.V. College Rath, affiliated to B.U. Jhansi. Cow and buffalo milk were obtained from the dairy of B.N.V. college Rath and University Dairy at Kanpur and Toned milk was purchased from market, processed and sold by milk board Nirala Nagar Kanpur in brand name of "Parag"

DETAILED TECHNICAL PROGRAMME OF THE PROJECT:

A. PARAMETERS OF THE STUDY

1. Types of milk -three

- (i) Cow milk (4% fat)
- (ii) Buffalo milk (6% fat)
- (iii) Toned milk (3% fat)

2. Levels of sugar-Three

- (i) 25% of khoa weight
- (ii) 30% of khoa weight
- (iii) 35% of khoa weight

3. Packaging materials -Two

- (i) polythelane Bags
- (ii) parchment paper

4. Shelf Life of Lal Pera

- (i) Temp. of storage - Room Temp.
- (ii) periods of storage
 - (a) Zero days
 - (b) one week
 - (c) Two weeks
 - (d) Three weeks

B. FACTORS TO BE STUDIED

- (i) Yield of Lal pera
- (ii) organoleptic quality
 - (a) Flavour
 - (b) Body & Texture
 - (c) Colour & appearance
 - (d) Sweetness
- (III) chemical Quality
 - (a) Total solids
 - (b) protein
 - (c) Fat
 - (d) sucrose
 - (e) Ash

(5) Microbiological Quality

- (a) Total plate count per gram

- (b) Yeast and mould count/g.
- (c) Califrom count/g.
- (xi) Assessment of cost and profit

c. **Replication -Three**

d. **Total No. of samples - $3 \times 3 \times 2 \times 4 \times 3 = 216$**

e. **Statistical Design - Factorial completely randomized design.**

MATERIAL

MILK :

Buffalo milk having 6 per cent fat, cow milk having 4 percent fat and Toned milk having 3 per cent fat were standardized using cream and skim milk powder by Pearson square method.

SUGAR :

cane sugar purchased from the market was used as sweetening agent.

EQUIPMENTS :

The equipments used for the preparation of lal pera were as follows.

1. Gas stove
2. Milk heating vessel (stainless steel karahi)
3. strainer
4. muslin cloth
5. stainless steel laddle
6. A centigrade thermometer.

MANUFACTURING PROCEDURE :

Munufacturing procedure of lal pera is composed of two major parts-

1. Khoa making
2. Lal Pera making

METHOD OF KHOA PREPARATION:

Normally 3kg of standradized milk (cow milk having 4% buffalo milk having 6% and Toned milk having 3% fat) was taken per batch and boiled in karahi over a brisk, non smoky fire. The milk was stirred vigorously and constantly with a circular motion by a khunti . During this operation all parts of the pan with which the milk came in contact were lightly scrapped to prevent the milk from scorching. Constant evaporation of moisture occurred and the milk thickened progressively. so for the process was similar to kheer making. However, no sugar was added and milk dehydration continued, Cow milk 2.8 times, buffalo milk 2.5 times and Toned milk 3.0 times), heat coagulation of milk proteins began and the concentrate became progressively "Insoluble", in water. This stage was marked by an abrupt change in colour. The heating was continued with greater control thereafter and speed of stirring cum scrapping was increased. Soon the viscous mass reached a semi solid pasty consistency and began to dry up. Very close attention was paid to the last stage. The final product was ready when it showed sign of leaving the bottom and sides of the karahi and sticking together. The khoa pat was invariably made after removing the pan from the fire and working the contents up and down in to a single compact mass.

METHOD OF LAL PERA PREPARATION :

Freshly made khoa broken into bits and cane sugar was mixed in to it at the rate of 25%, 30 % and 35 % by weight of khoa. Contents were transferred to a karahi and cooked over a very slow non-smoky fire ,stirring with a laddle,crushed cardamam was added and the mixture was ready to form balls when tested. Contents were than poured into a tray and left to cool and set. This Lal pera was cut into desired size and shape. This Lal pera was then packed into polythene and parchtment packs.

FLOW DIAGRAM OF LAL PERA PREPARATION

Freshly made khoa was broken into bits

|

cane sugar was mixed at rate of 25 % ,30 % and 35 % by weight of khoa.

|

Content were transferred into a karahi and cooked over a very slow non-smoky fire

|

stirred with a ladle

|

crushed cardamam, was added

|

Contents were changed into reddish colour.

|

Contents where then poured into a tray

|

Cooked to set

|

cut into size of 50 gm per piece and round flated shape

|

Lal pera

|

Packed into Polythene and Parchment paper packs.

|

Analysed for Organoleptic,Chemical and Microbiological quality tests.

METHOD OF ANALYSIS

A. YIELD OF PERA:

The Yield of pera was calculated by following formula:

$$\text{Yield (\%)} = \frac{\text{Weight of Lal Pera (gm)}}{\text{Weight of Milk (gm)}} \times 100$$

B. ORGANOLEPTIC QUALITIES :

Organoleptic qualities of pera judged by a panel of five Judges selected from Department of Animal Husbandry and Dairying C.S. Azad university of agriculture and Technology , kanpur. The quality was judged by using the following 100 points scale as recommended by sen and Rajorhia (1987) for sandesh as well as pera.

Attributes	Perfect score
flavour	45
Body & Texture	30
colour & Appearance	15
sweetness	10
Total	100

The product was considered excellent if it scored 80 and above; very good if scored 70 and above but less then 80; good if scored 60 and above but less then 70; fair if scored 50 to 59 and poor if scored less then 50.

C. CHEMICAL CONSTITUENTS:

1 . TOTAL SOLIDS CONTENT (%) OF PERA :

Total solids were determined as per method recommended by ISI (1981) for moisture determination in pera with slight modification.

A Clean porcelain dish was heated to a constant weight (w_1) 10 gm of finally ground and homogenous sample of Lal pera was accurately weighed in porcelain dish (w_2). Dish was transferred to an automatically controlled electric oven at a temperature of 100^0C for 3 to 4 hours. During this time the colour of pera changed from white to brown. The dish was then taken out from oven and cooled in a desiccator and weighed to a constant weight (w_3). Total solids were determined by following-

$$\text{FORMULA : Percent T.S.} = \frac{W_3 - W_1}{W_2 - W_1} \times 100$$

2. FAT CONTENT (%) OF PERA :

Fat content of pera was determined by Gerber's method as described in IS-1224 (part - II) - 1977 for analysis of cheese.

Five gm of pera sample was weighed in beaker and was converted into a paste by a glass rod with the help of small amount of hot distilled water. 1ml of ammonium hydroxide was added to it and again it was thoroughly mixed to bring the proteins in solution. The content was transferred into butter butyrometer. The beaker was washed by a little amount of hot distilled water. The washings were also transferred to the butyrometer. Ten ml sulphuric acid (Sp. gravity 1.82-1.825) and one ml of amyl alcohol (Sp. gravity 0.825) were added to it.

Hot distilled water was added, if necessary, to bring the level of limits of graduation on the stem of butyrometer. The Butyrometer was stoppered and the contents mixed well by thoroughly shaking. The butyrometer was then transferred in a water bath for five minutes main-

tained at a temperature of 70^0 F. Then the butyrometer was quickly transferred to Gerber's centrifuge and centrifuged for 5-6 minutes at a speed of 1200 r.p.m. The centrifuge was then stopped and the butyrometer taken out from the centrifuge. The butyrometer was again transferred to water bath at a temperature of 70^0 F for 5 minutes. The reading was observed from the graduated stem of butyrometer by manipulating the stopper.

3. PROTEIN CONTENT (%) OF PERA :

Protein content of pera was determined by standard method as recommended by ISI (1961) for milk protein determination.

Five gm of pera sample was taken into a clean Kjeldahl flask. 20 ml of pure nitrogen free sulphuric acid, 10 gm pure potassium sulphate crystals and few crystals of (0.2 gm or 200 mg) pure copper sulphate were added. After this , The flask was kept in the digestion chamber for digestion.

The digested material was taken out from the chamber. In this condition there was no black particles of carbonaceous matter. It was then allowed to cool, diluted with 300 ml distilled water and transferred to distillation flask.

To this a small quantity of pumic powder was also added. slowly 80 ml of 50 per cent Naoh solution was added to distillation flask so as to form a separate layer at the bottom of liquid seperately 50 ml of N/ 10 H_2SO_4 was taken in 500 ml beaker to be used to receive the condensate, four drops of methyl red indicator was added into it. Distillation was the done till the beaker condensate were about 300 ml. Using

usual precautions, the condensate was removed and the excess acid in the distillate was titrated with N/10 Naoh . Thus volume of N/10 H_2SO_4 used by ammonia for nautralization was detirmined. Percentage of protein in the sample was calculated with the help of following formula:

$$1\text{ml of N/10 } H_2SO_4 = 0.0014 \text{ gm N}_2$$

I. Percentage of nitrogen in the sample :

Amount of N/10 H_2SO_4 (ml) required to-

$$\frac{\text{neutralize} \times 0.0014}{\text{Weight of Lal Pera taken}} \times 100$$

II. Percent of protein :

Percent of nitrogen in the sample $\times 6.38$

4. SUCROSE CONTENT (%) LAL PERA :

Sucrose content of Lal pera was determined by volumetric method recommended by Lane-Eynon. The following method was follwowed

A. PREPARATION OF SOLUTION :

Weighed 40 gms of well mixed sample of the product and transferred to a 100 ml beaker. Added in beaker about 50 ml of hot water(80-90⁰c). The content was mixed well and transferred to a 250 ml. measuring flask, washed it with successive quantity of distilled water at 60⁰c until the volume was 120-150 ml. Mixed well and cooled down to room temperature, the re-after added 5 ml of diluteammonium solution mixed well and allowed to stand for 15 minutes. Thereafter exactly equivalent volume of dilute acetic acid was added to neutralize the previously added ammonia. Mixed again and added 12.5 ml. of zinc acetate solution followed by 12.5ml of potassium ferrocyanide solution. mixed again

and made up the volume exactly 250 ml allowed to settle and filtered. this solution was marked B_1 .

In a 100 ml volumetric flask took exactly 50 ml of solution B_1 and added 5 ml concentrated hydrochloric acid and heated at 68^0C for 5 minutes, cooled down the solution and neutralized with sodium hydroxide solution and made up the volume to 100 ml. This solution was marked as A_1 . Diluted the solution B_1 and A_1 so that the volume of 10 ml of Fehling's solution was 15 and 50 ml marked the solution as B_2 and A_2 respectively.

B. STANDARD METHOD OF TITRATION :

Pipetted out 10 ml of Fehling's solution into a 300 ml conial flask and allowed to run from the burette almost whole of the prepared solution B_2 required to effect reduction of all the copper. Gently boiled the content of the flask for 2 minutes, at the end of this period, added, without interruptin boiling, 1 ml of methylene blue indicator solution. When the content of the flask was boiling added, the prepared solution drop by drop from the burette till blue colour of the indicator just disappeared. Repeated the titration using the solution A_2 .

C. Calculation :

$$\text{sucrose (\%)} \text{ by wt} = \frac{20 W_1}{W_2} \left(\frac{2 f_2}{V_2} - \frac{f_1}{V_1} \right)$$

Where,

W_1 = Wt in mg of sucrose corresponding to 10 ml of Fehlin's solution,

W_2 = Wt in gm of the material taken for the determination.

f_2 = Dilution factor for solution A_2 from A_1

f_1 = Dilution factor for solution B_2 from B_1
 V_1 = volume in ml of solution A_1 Corresponding to 10 ml of
 Fehling's solution.
 V_2 = volume of ml of solution B_2 corresponding to 10 ml of
 Fehling's solution.

6. ASH CONTENT (%) OF PERA :

Took 5 gm of sample in a weighed silica dish (w) and found its weight (w_1). Added 6 ml of concentrated HNO_3 , heated to dryness, charged over a burner, finally ignited at a temperature below dull redness (so that chloride may not be lost) to make the ash free from carbon, cooled in a desiccator and took its weight (w_2).

Formula :

$$\% \text{ Ash} = \frac{W_2 - W}{W_1 - W} \times 100$$

Where:

W = weight of Lal Pera in gms.

W_1 = Weight of silica disc with samples in gms.

W_2 = Weight after ashing silica disc with ash in gms.

BACTERIOLOGICAL QUALITIES

Preparation and dilution of the samples for microbiological analysis :

Using all aseptic precautions 1 : 10 dilution of pera samples was made in standardised saline solution in a presterilized pestle and mortar. From the initial dilution subsequent decimal dilutions were made for plating.

1. TOTAL PLATE COUNT/GM OF PERA :

Total bacterial count was done on plate count agar medium using 1:100 and 1:100 dilutions. Proper dilution was transferred in duplicate sterilized petri plates. 10 ml of melted and cooked to 45^0 C plate count agar medium was poured in each petri plate. After thoroughly mixing. The plates were left for sometimes on the bench for solidification of the medium. All essential precautions were taken to avoid external contamination during plating. The inverted plates were placed in incubator maintained at 37 ± 1^0 C for 48 hours. After the incubation period. The colonies made by bacteria on the plates were counted with the help of colony counter. The number of bacteria was calculated by multiplying the number of dilution with number of colonies counted (Standard methods for the Examination of Dairy products, 1978).

2. YEASTS AND MOULDS COUNT/GM OF PERA :

For yeasts and moulds count 1:10 dilution of pera suspension was transferred in duplicate sterilized petriplates. 10 ml. melted potato dextrose agar medium was poured in each petri plate after thoroughly mixing. The plates were left for some time on the bench for solidification of the medium. All essential precautions were taken to avoid external contamination during plating. The inverted plates were placed in incubator maintained at 22 ± 1^0 C for 3 to 5 days. After incubation period the colonies made by yeasts and moulds on the plates were counted with the help of colony counter (standard Methods for the examination of Dairy products, 1978).

3. COLIFORM COUNT/GM OF PERA :

For coliform count 1:10 dilution was transferred in duplicate sterilized petri-plates. Ten ml melted and cooled to 45^0C violet red bile salt agar medium was poured in each petri-plate. After thoroughly mixing the plates were left for some time on the bench for solidification of medium. All essential precautions were taken during plating. The inverted plates were placed in incubator maintained at $37 \pm 1^0\text{C}$ for 24 hours. After incubation period the colonies made by bacteria on the plates were counted with the help of colony counter (Standarded Methods for the Examination of Dairy products, 1978).

4. Cost and profit per kg of lal pera :

For calculating the cost and profit per kg of Lal Pera the rates of cow, buffalo and Toned milk, cane sugar, heating medium, labour charge, packaging mterial and miscellaneous charges etc. were taken in to account. The rate of milk was considered on prevailing rates of milk in the market (Buffalo milk Rs. 14.00 Kg. per Kg, Cow milk Rs. 11.50 per kg. and Toned mild Rs. 9.50 per kg. The rate of cane sugar (Rs. 16.00 per kg.), heating medium charges (Rs. 2.50 per hour) labour charges (Rs. 50/8 hours per day), packaging material Rs. 0.40 and 1.06 per bag and miscellaneous charges Rs. 2.00 were taken as prevailing in the market.

Note: Rates of fat and S.N.F. per kg during study period were Rs. 48.00 and Rs. 32.00 respectively. These rates were of milk Board of Kanpur. The rates of milk were fixed as per rate of fat and S.N.F.

Rates of heating medium per burner was Rs. 2.50 / hours as per the rates of NOIDA, Kanpur.

F. STATISTICAL ANALYSIS:

1- INTRODUCTION:

In order to study the effects of three types of milk (M) three sugar levels (S) two packaging material (P) four storage period (D) and their interaction effects on the different characteristics of pera, an experiment was conducted and the data were collected. The analysis of variance of these data were worked out on the basis of factorial completely randomized design.

2. ANALYSIS OF VARIANCE :

In few cases, the factor of storage period was not there. The structure of analysis of variance (in such cases) was as given below.

Analysis of variance

Sources	D.f.
Treatments	17
M	2
S	2
P	1
M X S	4
M X P	2
S X P	2
M X S X P	4
Error	36
Total	53

In the remaining cases the date of the treatment combinations of the levels of all the four factors were available and the structure of analysis of variance for such cases was as under:

ANALYSIS OF VARIANCE

Sources	Df.
Treatments	53
M	2
S	2
P	1
D	2
M X S	4
M X P	2
S X P	2
S X D	4
P X D	2
M X S X P	4
M X S X D	8
M X P X D	4
S X P X D	4
M X S X P X D	8
Error	108
Total	161

3. CRITICAL DIFFERENCES :

In order to compare different treatment combinations, the relative critical difference was used. any differences of the two means

equal to or greater than the critical difference was declared as significant. This critical difference was calculated with the help of the following expression:

$$C.D. \text{ at } 5\% \text{ level} = \sqrt{\frac{2 V_E}{n}} \times t \text{ for } 5\% \text{ for Error D.F.}$$

Where,

V_E = Error mean square

n = Number of observations to which the means were based.

4. TRANSFORMATIONS :

In order to fulfil the condition for the analysis of variance, the following transformations of the data were used, where ever they were suitable.

if x = Original value

y = Transformed value

$$(a) \quad Y = \log 10 x$$

for back transformation

$$x = 10^Y$$

$$(b) \quad Y = 10 + \log 10$$

for back transformation

$$x = 100 \times \left(\frac{Y}{100 + Y} \right)$$

Where,

$$Y = (10)^{X-10} \left(\frac{K}{K+1} \right)$$

RESULT & DISCUSSION

RESULTS AND DISCUSSION

In the present investigation "Technological studies and shelf life of Lal Pera prepared from different types of milks", the types of milk, the levels of sugar, and packaging materials, periods of storage at room temperature were considered, the observation of yield, organoleptic qualities (Flavour, body and texture, colour and appearance and sweetness), chemical characteristics (total solids, protein, fat, sucrose and ash content), microbiological quality (total plate count, yeasts and moulds count and coliform count) and assessment of the cost and profit were recorded. The data thus obtained were analysed statistically by using factorial completely randomized design.

1- YIELD (%) OF LAL PERA :

The comparison of the different combinations with respect to yield (%) of Lal pera has been presented in table 1-A and 1-B and also illustrated in fig-1.

From table 1-A, it is obvious that the highest yield (26.18%) was observed in case of Lal Pera made from buffalo milk khoa and lowest yield (20.30%) was in case of Pera made from toned milk Khoa.

As the buffalo milk contains higher total solids in comparison to

cow and toned milk, the yield (%) of lal pera made from buffalo milk Khoa in present investigation was found to be higher than Lal pera made from cow and toned milk Khoa.

so for as the sugar level is concerned, the higher yield of Lal pera (25.22%) was noted with 35% sugar level, while in case of 30% and 25% levels of sugar the yield (%) was significantly lower than that of 35% level of sugar.

The increased sugar level (35%) clearly showed an increasing effect on yield (%) of pera. In the present investigation, therefore the highest yield (%) was found in case of lal pera containing higher sugar level (35%) and the lowest yield (%) was noted as the sugar level decreased. In other word, the yield of lal pera was directly proportional to total solids, fat and sugar levels in khoa sample.

Among the packaging materials of lal pera higher and lower yields (23.93%) and (23.75%) were found in polythene and parchment paper respectively.

From table 1-B, it was observed that the highest yield (26.97%) of lal pera was noted in case of Lal pera made from buffalo milk Khoa having 35% sugar with polythene packaging ($M_1 S_3 P_1$). Followed by Lal pera made from buffalo milk Khoa having 35% sugar level packaged in parchment paper $M_1 S_3 P_2$ (26.81%). The two treatment combination were statistically at par.

From table 1-C, of analysis of variance of the yield (%) of the different treatment combinations it was observed that highly significant differences were noted among the types of milk (M) levels of

cow and toned milk, the yield (%) of Lal pera made from buffalo milk Khoa in present investigation was found to be higher than Lal pera made from cow and toned milk Khoa.

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From table 1-C, of analysis of variance of the yield (%) of the different treatment combinations it was observed that highly significant differences were noted among the types of milk (M), levels of

Sugar (S) and types of packaging materials (P) of Lal pera. The M and S treatment combinations were highly significant at 0.1 % level of significance. All the interactions were found to be non-significant.

The findings led to the conclusion that highest yield (%) is obtained in case of fresh lal pera made from buffalo milk Khoa having 35% sugar level with polythene packing. It is therefore, concluded that the yield of lal pera is directly proportional to total solids, fat levels in khoa.

TABLE-1 (A)

EFFECT OF TYPES OF MILK, SUGAR LEVEL AND PACKAGING MATERIAL ON THE

YIELD (%) OF LAL PERA.

	S_1	S_2	S_3	P_1	P_2	Mean
M_1	24.89	25.45	60.68	27.00	26.90	26.18
M_2	21.28	22.09	22.62	23.30	23.12	22.48
M_3	19.21	20.14	20.33	21.01	20.82	20.30
S_1				22.40	22.12	22.26
S_2				24.02	23.88	23.95
S_3				25.82	25.66	25.74
Mean	21.79	22.56	23.21	23.93	23.75	$GM = 23.49$

TABLE-1 (B) MSP MEANS OF YIELD (%) OF LAL PERA.

	S ₁		S ₂		S ₃	
	P ₁	P ₂	P ₁	P ₂	P ₁	P ₂
M ₁	25.01 (30.02)	24.98 (29.98)	25.52 (30.36)	25.49 (30.30)	26.97 (31.28)	26.81 (31.20)
M ₂	21.54 (27.64)	21.52 (27.62)	22.16 (28.10)	22.09 (28.02)	22.93 (28.61)	22.84 (25.55)
M ₃	19.33 (26.10)	19.30 (26.06)	20.31 (26.80)	20.24 (26.75)	20.90 (27.20)	20.83 (27.15)

ABBREVIATIONS

S1=25% SUGAR
S2= 30% SUGAR
S3= 35% SUGAR

M1= BUFFALO MILK
M2= COW MILK
M3= TONED MILK

P1=POLYTHINE PACK.
P2=PARCHMENT PAPER PACK.

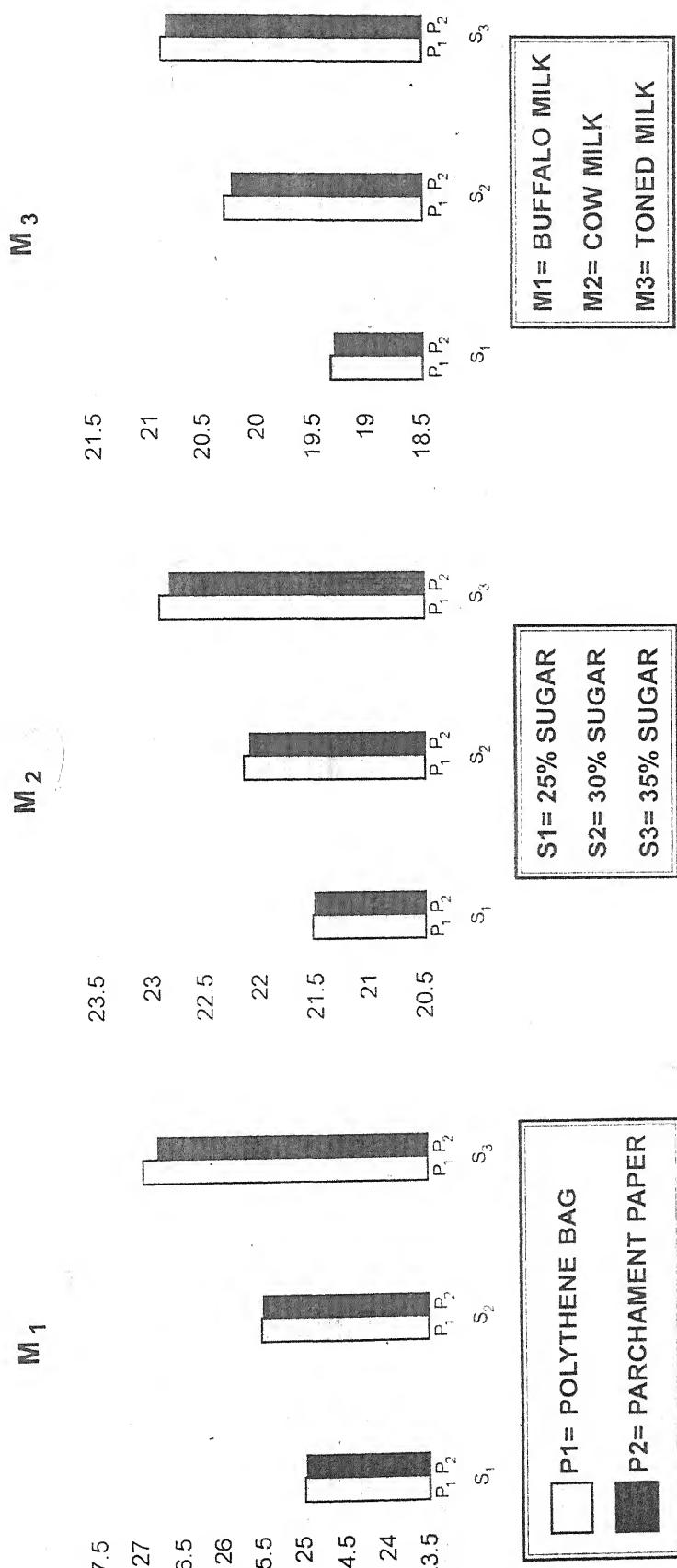
TABLE-1 (C) MSP MEANS OF ON YIELD (%) OF LAL PERA.

S.V.	DF	SS	MS	F
M	2	135.874522	67.937261	810.33 **
S	2	10.724809	5.362404	48.170.39 **
P	1	0.043919	0.0443919	0.39 NS
MxS	4	0.481875	0.120469	1.08 NS
MxP	2	0.001437	0.000719	1.01 NS
SxP	2	0.004070	0.002035	0.02 NS
MxSxP	4	0.002434	0.000608	0.01 NS
Error	36	4.007232	0.111312	

SE (M) , SE (D) AND CD TABLE

	m	s	p	MxS	MxP	SxP	MxSxP
SE(m)	0.0786	0.0786	0.0642	0.1362	0.1112	0.1112	0.2724
SE (d)	0.1112	0.1112	0.0908	0.1926	0.1573	0.1573	0.3852
CD (5%)	0.2255	0.2255	0.1841	0.3906	0.3190	0.3190	0.7812

FIG.-1 EFFECT OF TYPES OF MILK, LEVELS OF SUGAR AND PACKAGING MATERIALS ON THE YIELD (%) OF LAL PERA.



2- ORGANOLEPTIC QUALITY :

A- FLAVOUR SCORE :

The comparison of the different combinations with respective flavours of lal pera has been presented in table 2A & 2B and illustrated in fig. 2.

From table 2A it is clear that the highest score of flavour (39.26) was in case of lal pera made from buffalo milk khoa and the lowest score of flavour (35.50) was in case of pera made from toned milk khoa.

The reason for high flavour scores in pera made from buffalo milk khoa might be due to presence of high fat in khoa than pera made from cow and toned milk khoa.

So far as the sugar level is concerned the highest score of flavour (40.20) was in case of 35% sugar level while 25% & 30% levels of sugar showed almost similar flavour score but the flavour was significantly inferior to that of 35% level of sugar.

The sweetness also contributes flavour to the product therefore the Lal pera, containing higher sugar level was found most acceptable as compared to lower sugar levels.

Among the packaging materials ,the sample packaged in polythene contained higher score (38.80) as compared to parchment paper (33.77). So far as storage period is concerned fresh, samples scored highest (40.59). After that the intensity of flavour significantly deteriorated with the increase in periods of storage at room temperature .

The storage of Lal pera samples at room temperature indicated deterioration in flavour of Lal pera as the storage period increased which might be due to microbial activity and contamination during handling and storage of Lal pera.

From Table 2A. indicating means of type of milk and periods of storage (MxS treatment combinations) , it was observed that the highest score for flavour (42.02) was in case of fresh Lal pera made from buffalo milk khoa ($M_1 \times D_1$). All the remaining treatment combinations of the types of milk and storage periods (MxD) showed significantly lower flavour score than that of fresh Lal pera made from buffalo milk khoa ($M_1 \times D_1$). The lowest flavour score (30.88) was observed in case of Lal pera samples made from toned milk khoa stored for 21 days at room temperature ($M_3 \times D_4$). From means of levels of sugar and periods of storage (SxD) it was observed that the highest flavour score (42.63) was in case of 35% sugar level in fresh Lal pera ($S_3 \times D_1$) and this was significantly higher than the average flavour score (33.42) in case of pera samples made with 25% sugar level and stored for 21 days at room temperature ($S_3 \times D_4$).

From table 2-B. it is obvious that the highest flavour score (43.60) were noted when the pera samples were fresh prepared from buffalo milk khoa having 35% sugar and packaged in polythene ($M_1 S_3 P_1 D_1$) followed by Fresh Lal pera made from buffalo milk Khoa having 25% sugar level in polythene packing ($M_1 S_1 P_1 D_1$) (41.92), fresh Lal pera made from cow milk khoa having 35% sugar level in the polythene packing ($M_2 S_3 P_1 D_1$) (41.92), fresh pera made from buffalo milk Khoa

having 35% sugar level in the Parchment paper ($M_1 S_3 P_2 D_1$) pera made from cow milk khoa having 25% sugar level in the polythene packing and stored for 21 days ($M_3 S_1 P_1 D_4$) (34.68), fresh pera made from tonned milk Khoa having 35% sugar level in the polythene packing ($M_3 S_3 P_1 D_1$) and fresh pera made from buffalo milk Khoa having 30% sugar level in the polythene packing, ($M_1 S_2 P_1 D_1$) (42.75), all these treatment combinations were statisfactory at par.

From table 2-C. Showing analysis of variance of the flavour score of tha different tretment combinations it was indicated that there were highly significant diffrences among the three types of milk (M) different levels of sugar (S) Two types of packing (P) used for khoa packing for diffrent periods of storage at room temperature (D). All the four treatment combinations were significantly different at .5% level of significance . The first order interactions (SxD) were found to be significant at .1% levels of significance.The significant interactions indicates that the differential effect of two levels of one factor changes with the change in the levels of other factors .The findings led to the conclusion that best flavour in fresh lal pera could be obtained when it is made from buffalo milk khoa having 35% sugar and kept in the polythene pack- ing .

TABLE-2 (A)

EFFECT OF TYPES OF MILK, LEVELS OF SUGAR, PACKAGING MATERIALS AND PERIODS OF STORAGE ON THE FLAVOUR SCORE OF LAL PERA.

	S ₁	S ₂	S ₃	P ₁	P ₂	D ₁	D ₂	D ₃	D ₄	Mean
M ₁	37.82	38.22	40.87	40.93	40.83	42.02	39.89	36.99	35.81	39.26
M ₂	36.01	36.16	39.58	39.63	39.59	40.81	39.23	35.88	33.82	37.86
M ₃	33.87	34.33	37.35	37.52	37.42	38.85	36.88	32.42	30.88	35.50
S ₁				37.08	34.68	40.82	38.99	36.82	35.03	37.24
S ₂				40.12	38.62	42.63	41.63	40.03	38.14	40.20
S ₃				37.52	35.49	39.12	37.18	35.80	33.42	36.42
P ₁					40.44	40.02	37.04	33.98	37.87	
P ₂					40.00	38.07	35.14	33.60	36.70	
Mean	35.90	36.24	39.27	38.80	37.77	40.59	38.99	36.27	34.34	37.63

TABLE-2 (B)

MSPD MEANS FOR FLAVOUR SCORE OF LAL PERA.

		P ₁				P ₂			
		D ₁	D ₂	D ₃	D ₄	D ₁	D ₂	D ₃	D ₄
M ₁	S ₁	41.98	40.57	38.88	36.99	41.77	40.33	38.32	36.22
	S ₂	42.75	41.25	39.58	37.87	42.67	40.87	38.87	32.21
	S ₃	43.60	42.00	40.32	38.43	43.33	41.81.	40.01	38.21
M ₂	S ₁	39.00	37.90	36.42	34.68	38.93	37.54	36.00	37.14
	S ₂	40.44	39.02	37.33	35.47	40.31	38.80	37.00	35.01
	S ₃	41.93	40.58	39.14	37.20	41.67	40.09	38.08	36.68
M ₃	S ₁	37.87	36.32	36.62	32.80	37.55	36.00	34.03	32.22
	S ₂	38.98	37.28	35.92	33.61	38.62	36.78	35.00	33.01
	S ₃	40.00	38.58	36.94	35.07	39.53	38.06	36.44	34.81

ABBREVIATIONS

S1=25% SUGAR
S2=30% SUGAR
S3=35% SUGAR

M1= BUFFALO MILK
M2= COW MILK
M3= TONED MILK

P1=POLYTHINE PACK.
P2= PARCHAMENT PAPER PACK.

TABLE-2 (C) ANOVA FOR FLAVOUR SCORE .

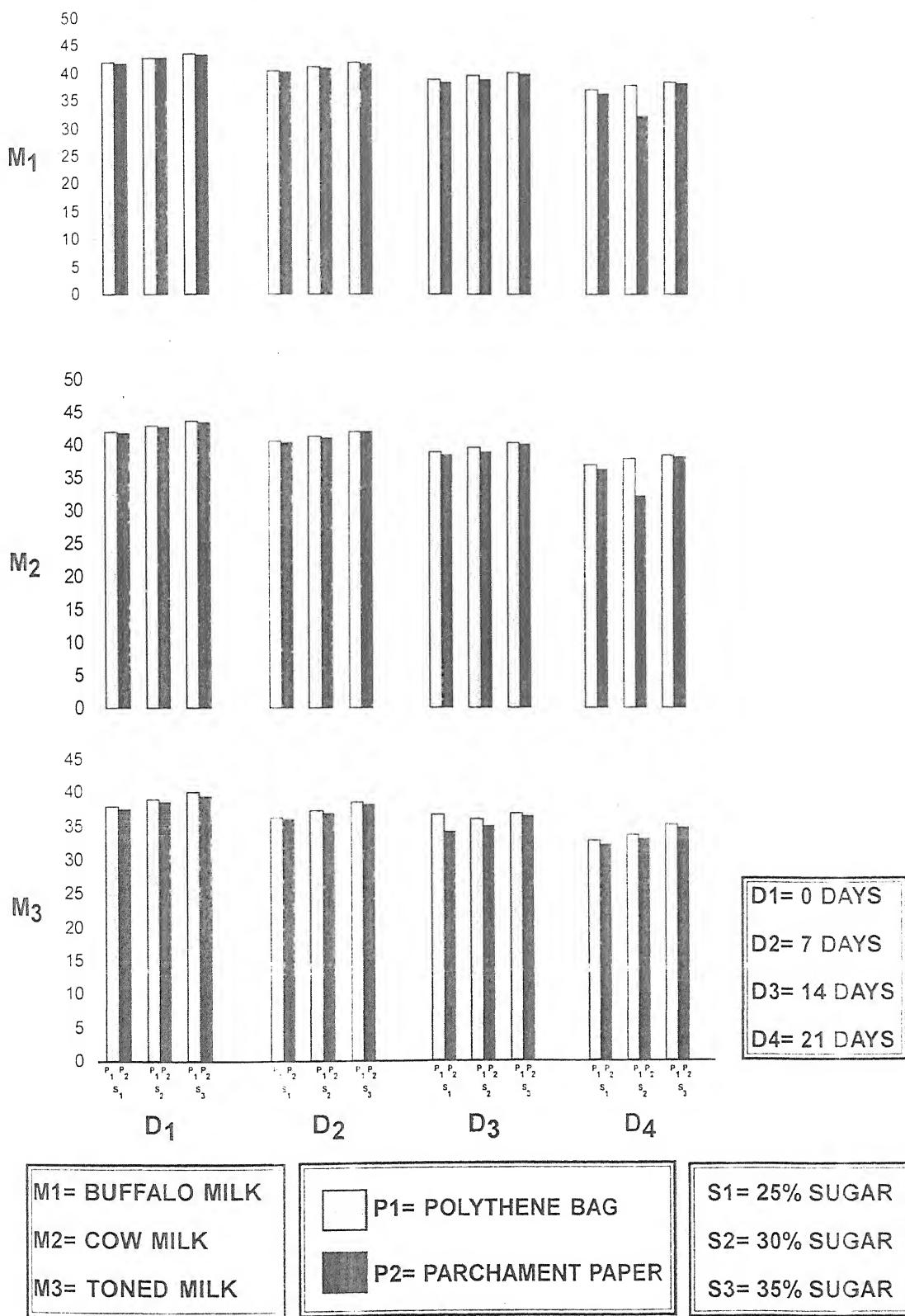
S.v.	D.f.	SS	MSS	F.Cal
M	2	470.690	235.480	1065.52 **
S	2	144.177	72.088	326.19 **
P	1	15.682	15.8682	70.96 **
D	3	799.179	266.393	1205.40 **
MxS	4	3.801	3.950	4.30 **
MxP	2	4.151	2.076	9.39 **
MxD	6	17.105	2.851	12.90 **
SxP	2	2.901	1.451	6.57 **
SxD	6	14.869	2.478	11.21 **
PxD	3	3.240	1.080	4.89 **
MxSxp	4	4.323	1.081	4.89 **
SxPxD	6	8.374	1.396	6.32 **
MxPxD	6	9.776	1.629	7.37 **
MxSxPxD	12	14.835	1.236	5.59 **
Error	110	34.432	—	—

SE (M) SE (D) AND CD. TABLE

	M	S	P	D	MxS	MxP	MxD	SxP	SxD
SE(m)	0.055	0.055	0.045	0.064	0.096	0.078	0.111	0.078	0.111
SE(d)	0.078	0.078	0.064	0.090	0.136	0.110	0.157	0.110	0.157
CD(5%)	0.152	0.152	0.125	0.177	0.266	0.216	0.308	0.216	0.308

	PxD	MxSxP	SxPxD	MxPxD	MxSxPxD
SE(m)	0.090	0.096	0.157	0.157	0.271
SE(d)	0.127	0.136	0.222	0.222	0.383
CD(5%)	0.249	0.266	0.435	0.435	0.751

FIG.-2 EFFECT OF TYPES OF MILK, LEVELS OF SUGAR AND PACKAGING MATERIALS ON THE FLAVOUR SCORE OF LAL PERA.



B- BODY AND TEXTURE SCORE:

The comparison of the different combinations with respective body and texture of lal pera has been presented in table 3A and 3B and also illustrated in fig. 3.

From table 3A: it is evident that the highest score for body and texture (20.87) was in case of Lal pera made from buffalo milk khoa and the lowest score (18.26) was in case of lal pera made from toned milk Khoa.

The body and texture of buffalo milk khoa was found superior than the cow and toned milk khoa due to higher milk fat content, therefore , the body and texture of lal pera made from buffalo milk khoa in present investigation was found to be superior than lal pera made from cow milk and toned milk khoa .

So for as the sugar level is concerned , the highest score for body and texture (20.14) was in case of 35% sugar level, while in case of 25% and 30% levels of sugar the body and texture score were significantly lower. The present findings reveal that the lal pera made with 35% sugar level showed more elastic body and texture and lal pera having 25% level of sugar showed brittle body and texture , while pera with 35% sugar level showed smooth body and texture which was superior than all other level of sugars .

Among the packing materials , significantly higher score for body & texture (20.87) and (20.63) were observed in polythene and parchment paper respectively.

As regards the periods of storage of lal pera, it was observed

that the highest score for body and texture (20.61) was when it was fresh. After that the quality of body & texture significantly deteriorated with increasing periods of storage at room temperature.

While storaging pera at room temperature the moisture content reduced so that the body & texture of lal pera stored for longer period, was found to be inferior than the lal pera stored for shorten period.

From table 3B : it was observed that the highest body and texture score (21.64) was in case of fresh lal pera made from buffalo milk khoa having 35% sugar level in polythine packing ($M_1 S_3 P_1 D_1$).

From Table - 3C showing analysis of Variance of body and texture score of different treatment combinations it was observed that there were highly significant differences among the types of milk (M) , different level of sugars (S) types of packing matalrial (P) and different periods of storage at room temperature (D) of lal pera. All the four treatment combinations differed highly significantly at .1 % level of significance . The interactions (MxC) were found to be significant at 5% level of significance. All other interactions were found to be non-significant.

From the present findings it was concluded that best body and texture could be obtained in fresh lal pera made from buffalo milk khoa having 35% sugar in polythine packs .

TABLE-3 (A)

EFFECT OF TYPES OF MILK, LEVELS OF SUGAR, PACKAGING MATERIALS AND PERIODS OF STORAGE ON THE BODY AND TEXTURE SCORE OF LAL PERA.

	S1	S2	S3	P1	P2	D1	D2	D3	D4	Mean
M1	19.90	20.77	21.68	22.00	21.83	21.52	20.87	19.88	18.72	20.87
M2	18.57	19.14	19.86	21.11	20.78	19.83	19.02	18.07	17.01	19.27
M3	17.63	18.13	18.88	19.99	19.60	18.83	18.07	17.11	16.09	18.26
S1				19.87	19.80	20.00	19.50	18.89	18.30	19.39
S2				20.63	20.42	20.80	20.32	19.58	18.62	20.06
S3				21.60	21.37	21.70	21.08	20.22	19.71	20.95
P1						21.52	21.02	20.49	19.23	20.57
P2						20.65	20.14	19.51	18.48	19.70
Mean	18.70	19.35	20.14	20.87	20.63	20.61	20.00	19.22	18.27	19.88

TABLE-3 (B) MSPD MEANS FOR BODY AND TEXTURE SCORE OF LAL PERA.

		P1				P2			
		D1	D2	D3	D4	D1	D2	D3	D4
M1	S1	19.87	19.56	19.00	18.38	19.83	19.44	18.96	18.32
	S2	20.72	20.39	20.01	19.50	20.63	20.14	19.50	18.80
	S3	21.64	21.35	20.84	20.01	21.52	21.14	19.52	18.90
M2	S1	18.52	18.26	17.84	17.36	18.48	18.17	17.92	17.26
	S2	19.66	19.30	18.58	1760	19.52	19.14	18.49	17.48
	S3	19.80	19.44	18.92	18.14	19.64	19.26	18.62	18.10
M3	S1	17.56	17.10	16.50	15.92	17.49	17.08	16.58	15.80
	S2	18.08	17.52	16.86	16.13	18.00	17.38	16.38	16.00
	S3	18.82	18.44	17.88	17.21	18.73	18.26	17.56	16.93

ABBREVIATIONS

P1=POLYTHINE PACK.
P2=PARCHAMENT PAPER PACK.

S1=25% SUGAR
S2=30% SUGAR
S3=35% SUGAR

M1=BUFFALO MILK
M2=COW MILK
M3=TONED MILK

Table-3 (C)

ANOVA TABLE FOR BODY AND TEXTURE SCORE

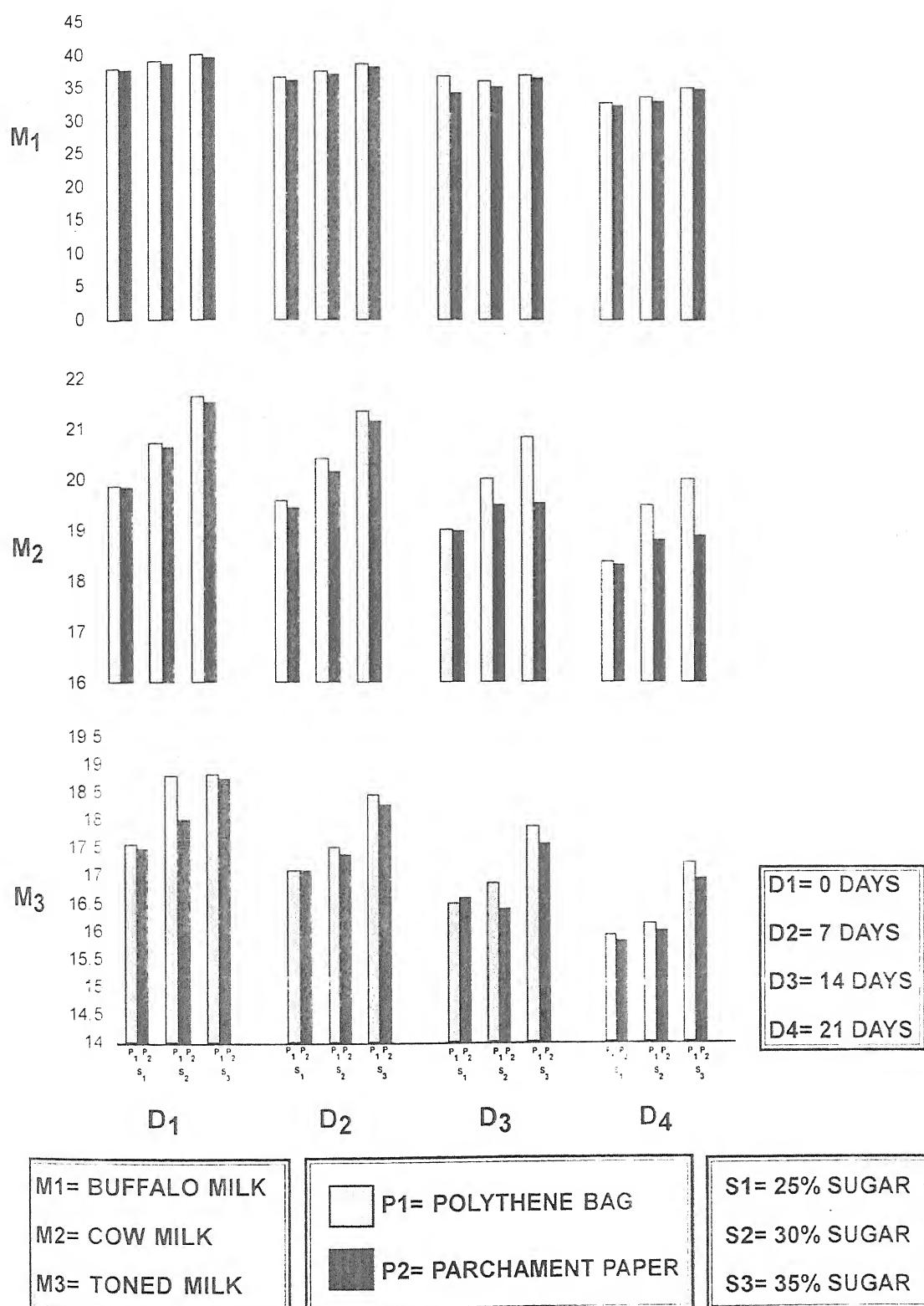
S.V.	D.f.	SS	MSS	F.Cal
M	2	28.2347	14.1174	322.32 **
S	2	6.0313	3.0156	68.85 **
P	1	0.2774	0.2774	6.33 **
D	3	10.0299	3.3433	76.33 **
MxS	4	0.4179	0.1045	2.38 *
MxP	2	0.0842	0.0421	0.96 NS
MxD	6	0.0460	0.0077	0.17 NS
SxP	2	0.10069	0.0503	1.15 NS
SxD	6	0.1412	0.0235	0.54 NS
PxD	3	0.0559	0.0186	0.42 NS
MxSxp	4	0.0826	0.0206	0.47 NS
SxPxD	6	0.4227	0.0705	1.61 NS
MxPxD	6	0.4382	0.0730	1.67 NS
MxSxPxD	12	0.8243	0.0687	1.57 NS
Error	156	6.8328	0.0438	--

SE (M) SE (D) AND CD. TABLE

	M	S	P	D	MxS	MxP	MxD	SxP	SxD
SE(m)	0.025	0.025	0.020	0.028	0.043	0.035	0.049	0.035	0.049
SE(d)	0.035	0.035	0.028	0.040	0.060	0.049	0.070	0.049	0.070
CD(5%)	0.068	0.068	0.056	0.079	0.118	0.097	0.137	0.097	0.137

	PxD	MxSxP	SxPxD	MxPxD	MxSxPxD
SE(m)	0.040	0.043	0.070	0.070	0.121
SE(d)	0.057	0.060	0.099	0.099	0.171
CD(5%)	0.112	0.118	0.193	0.193	0.335

FIG.-3 EFFECT OF TYPES OF MILK, LEVELS OF SUGAR,
PACKAGING MATERIALS AND PERIODS OF STORAGE
ON THE BODY AND TEXTURE SCORE OF LAL PERA.



C- COLOUR AND APPEARANCE SCORE :

The comparison of the different combinations with respect to colour and appearance scores of lal pera has been presented in Table 4 A and 4 B and illustrated in fig. 4.

From table 4 A, it is evident that the highest score for colour and appearance (87.69) was in case of Lal pera made from buffalo milk khoa and the lowest score (7.68) was in case of pera made from toned milk khoa.

In the present findings the colour and appearance of Lal pera made from buffalo milk khoa was of superior quality than that made from cow and toned milk khoa .

so far as the sugar level is concerned, the highest score of colour and appearane (8.66) was found with 35% sugar level, while 25% and 30% levels showed nearly similar score of colour and appearance but the scores were significantly lower to that of 35% level of sugar.

The present findings reveal that the colour and appearance of lal pera containing 35% sugar was very much liked by the panel of Judges.

Among the packing materials significantly higher scores were observed for colour and appearance in polythene packs (7.97) than parchment paper packs (7.44).

As regards the periods of storage of pera it was observed that the highest score for colour and appearance (8.60) was observed when it was fresh. After that the colour and appearance significantly deterio-

rated with the increase in period of storage at room temperature.

Due to evaporation of moisture during storage at room temperature for longer periods the colour and appearance of Lal pera showed dark colour and poor appearance as compared to fresh pera.

From the table 4A showing means of sugar levels and packaging materials (s x p) it was observed that the highest score with regard to colour and appearance (9.03) was observed in case of 35% sugar level in the polythene packs ($S_3 P_1$) which was significantly higher than the colour and appearance scores of other treatment combinations, while the lowest scores were obtained when the samples were treated with 25 % sugar ($S_3 P_1$) in polythene packaging.

From means of levels of sugar and periods of storage (S x D) it was observed that the highest colour and appearance Score (7.10) was observed in case of fresh lal pera with 35% sugar ($S_3 D_1$) which was significantly higher than the average colour and appearance score of the remaining treatment combinations.

The lowest colour and appearance score (7.00) was noted when the lal pera samples were prepared with 25% sugar and stored for 3 weeks at room temprature ($S_1 D_4$).

Table 4-b it was revealed that the highest colour and appearance seore (10.08) was noted in case of fresh pera made from buffalo milk khoa having 35% sugar packed in the polythene ($M_1 S_3 P_1 D_1$) followed by fresh Lal pera made from cow milk with 35 % sugar packed in polythene($M_2 S_3 P_1 D_1$).

The analysis of variance of the colour and appearance score of

the different treatment combinations (table 4C) revealed highly significant differences among the types of milk (M) levels of sugar (S) types of packing materials (P) and periods of storage at room temperature (D). All the four treatment combinations differed significantly at .1% levels of significance. The first order interaction (MxP & SxD) also differed highly significantly at .1% level of significance.

It is, therefore concluded that the fresh lal pera having good colour and appearance could be prepared from buffalo milk khoa with 35% sugar. Work has been reported so far on lines.

TABLE-4 (A)

EFFECT OF TYPES OF MILK, LEVELS OF SUGAR AND PACKAGING MATERIALS, AND PERIOD OF STORAGE ON THE COLOUR AND APPEARANCE SCORE OF LAL PERA.

	S1	S2	S3	P1	P2	D1	D2	D3	D4	Mean
M1	8.23	8.48	9.14	3.00	8.88	9.10	8.88	8.52	8.00	8.69
M2	7.73	8.00	8.44	8.32	8.09	8.42	8.20	7.82	7.19	8.02
M3	7.20	7.56	8.16	8.02	7.72	8.11	7.92	7.56	7.01	7.68
S1				8.14	7.76	8.22	7.89	7.50	7.00	7.75
S2				8.40	7.80	8.43	8.23	7.98	7.51	8.06
S3				9.03	8.35	9.10	8.88	8.53	8.06	8.66
P1					9.06	8.14	7.64	7.02	7.97	
P2						8.32	7.78	7.14	6.50	7.44
Mean	7.72	8.01	8.58	8.49	8.1	8.60	8.24	7.84	8.29	8.03

TABLE-4 (B) MSPD MEANS FOR COLOUR AND APPERANCE SCORE OF LAL PERA.

		P1				P2			
		D1	D2	D3	D4	D1	D2	D3	D4
M1	S1	8.56	8.10	7.48	6.80	8.50	8.08	7.40	6.66
	S2	9.60	9.14	8.58	8.01	9.52	9.07	8.53	7.89
	S3	10.08	9.64	9.04	8.38	10.04	9.62	9.00	8.34
M2	S1	8.10	7.89	7.23	6.40	8.08	7.80	7.09	6.35
	S2	8.66	8.20	7.72	7.11	8.58	8.11	7.53	6.89
	S3	9.18	8.88	8.50	8.00	9.00	8.53	8.00	7.33
M3	S1	7.62	7.30	6.73	6.00	7.52	7.17	6.45	5.92
	S2	8.19	7.72	7.12	6.31	8.00	7.39	6.82	6.08
	S3	9.00	8.61	8.09	7.39	8.52	8.00	7.33	6.49

ABBREVIATIONS

S1=25% SUGAR
 S2=30% SUGAR
 S3=35% SUGAR

M1=BUFFALO MILK
 M2=COW MILK
 M3=TONED MILK

P1=POLYTHINE PACK.
 P2=PARCHAMENT PAPER PACK.

TABLE-4 (C) ANOVA TABLE FOR COLOUR AND APPEARANCE

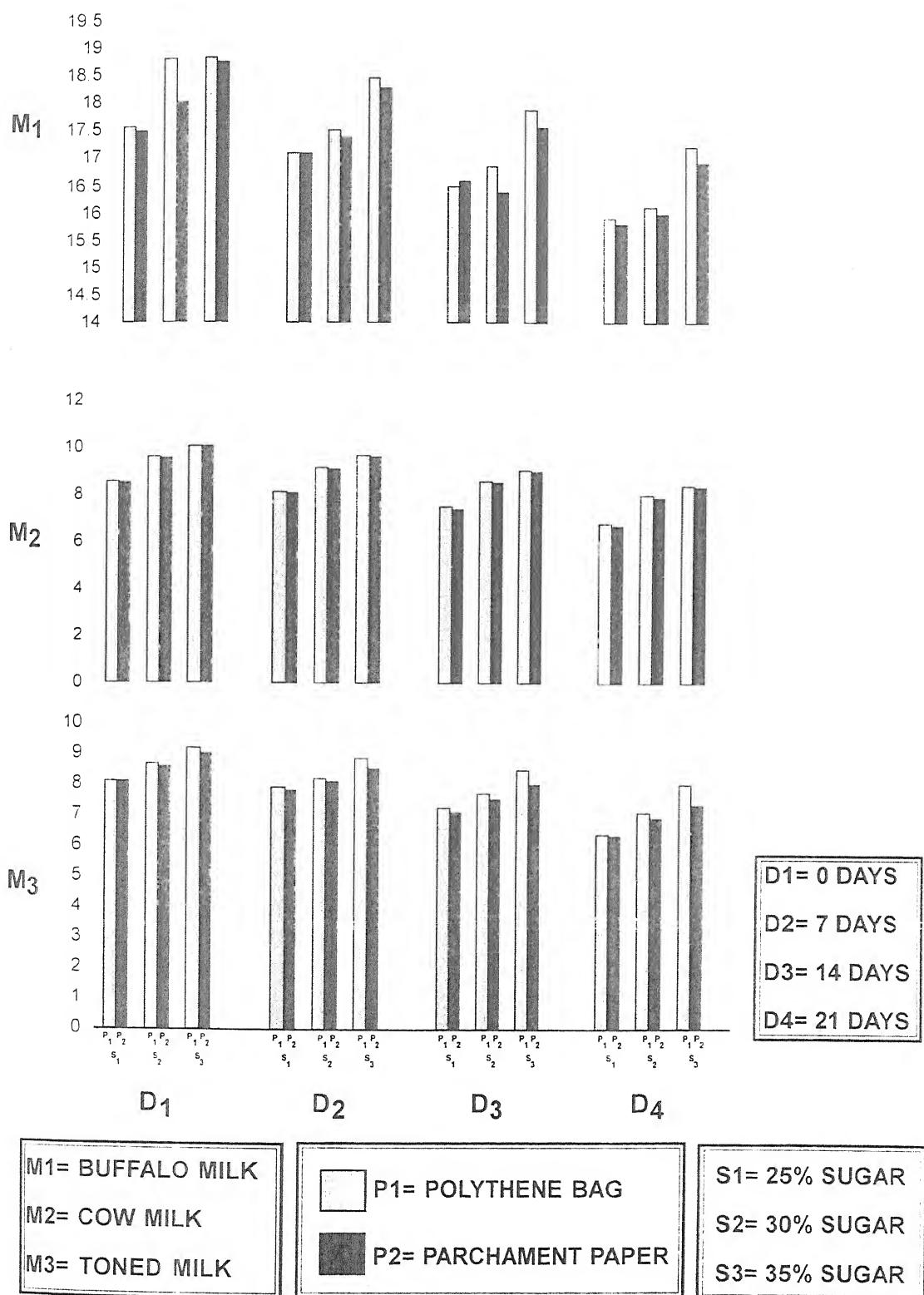
S.v.	D.f.	SS	MSS	F.Cal
M	2	57.599	28.800	1066.76 **
S	2	55.390	27.695	1025.74 **
P	1	2.490	2.490	92.22 **
D	3	87.350	29.117	1078.84 **
MxS	4	4.022	1.005	37.22 *
MxP	2	0.824	0.412	15.26 **
MxD	6	0.198	0.033	1.22 NS
SxP	2	0.796	0.398	14.74 **
SxD	6	0.170	0.028	1.04 NS
PxD	3	0.163	0.054	2.00 **
MxSxP	4	0.123	0.031	1.15 NS
SxPxD	6	0.178	0.030	1.11 NS
MxPxD	6	0.181	0.030	1.11 NS
MxSxPxD	12	0.197	0.016	0.59 NS
Error	156	4.288	0.027	--

SE (M) SE (D) AND CD. TABLE

	M	S	P	D	MxS	MxP	MxD	SxP	SxD
SE(m)	0.019	0.019	0.016	0.022	0.033	0.027	0.039	0.027	0.039
SE(d)	0.027	0.027	0.038	0.31	0.047	0.038	0.055	0.038	0.055
CD(5%)	0.053	0.053	0.074	0.061	0.092	0.074	0.108	0.074	0.108

	PxD	MxSxP	SxPxD	MxPxD	MxSxPxD
SE(m)	0.032	0.034	0.055	0.055	0.095
SE(d)	0.045	0.048	0.078	0.078	0.134
CD(5%)	0.088	0.094	0.153	0.153	0.263

FIG.-4 EFFECT OF TYPES OF MILK, LEVELS OF SUGAR,
PACKAGING MATERIALS AND PERIOD OF STORAGE
ON THE COLOUR AND APPEARANCE SCORE OF LAL
PERA.



D- SWEETNESS SCORE:

The comparison of the different combinations with respect to sweetness of Lal pera has been presented in Table 5A & 5B and also illustrated in fig. 5.

From Table 5A, it is indicated that the highest score for sweetness (6.72) was found in case of pera made from buffalo milk khoa and the lowest score (6.17) was in case of pera made from cow milk khoa. Due to low salt content the buffalo milk khoa is sweeter than Toned & cow milk khoa .

The buffalo milk khoa was found to be the best than pera made from toned and cow milk khoa.

So far as the sugar level in concerned, the highest sweetness scores (7.37) was in case of 35% sugar level, while in case of 25% and 30% level of sugar the sweetness scores were significantly lower to that of 35% sugar.

The present findings revealed that the sweetness of Lal pera was directly proportional with levels of sugar.

Among the packing materials a significantly higher score for sweetness (6.72) was observed in polythene than parchment paper (6.24).

As regard the periods of storage, it was observed that the highest score for sweetness (6.59) was when the samples were fresh. after that the sweetness significantly deteriorated with the increasing period of storage at room temperature.

The storage of Lal pera at room temperature reduced the mois-

ture content and therefore, the sweetness of lal pera stored for longer periods increased in comparison to the lal pera stored for lesser priods.

From Table - 5A of means of types of milk and packaging materials (MxP) treatment combinations, it was found that the highest score for sweetness (7.59) was with in the present of polyhthene packing ($S_3 P_1$). All the other treatment combinations, showed significantly lower score than 35% sugar level with polythene packing ($S_3 P_1$).

The lowest sweetness was noted (5.58) in 25% sugar level in the parchment paper ($S_1 P_2$).

From means of levels of sugar and periods of storage (SxD), it was observed that the highest sweetness score (7.33) was in case of 35% sugar level of fresh lal pera ($S_3 D_1$) which was significantly higher than the average sweetness score (5.13) in case of 25% sugar and stored for 21 days ($S_1 D_4$).

From Table 5B it is evident that the highest sweetness score (8.51) was in case of fresh lal pera made from buffalo milk khoa having 35% sugar packed in the polythene ($M_1 S_3 P_1 D_1$).

However all other treatments showed non-significant differences between them.

From Table 5C showing analysis of variance of the sweetness score of different combination it was found that there were highly significant differences among the types of milk (M) levels of sugar (S) packing material and periods of storage (D) of lal pera.

All the four treatment combinations differed highly significantly at .1% level of significance .The intraction between PxD were found to

be significant at 5% levels of significances. All other interactions were found to be non significant.

The significant interactions indicated that the differential effect of the two levels of one factor changed with the change in the level of other factors.

From the present findings it was concluded the best sweetness in fresh lal pera may be achieved when prepared from buffalo milk having 35% sugar in polythene packing.

TABLE-5 (A) EFFECT OF TYPES OF MILK, LEVELS OF SUGAR, PACKAGING MATERIALS AND PERIODS OF STORAGE ON THE SWEETNESS SCORE OF LAL PERA.

	S1	S2	S3	P1	P2	D1	D2	D3	D4	Mean
M1	5.53	6.52	7.54	7.00	6.54	6.99	6.88	6.80	6.64	6.72
M3	5.58	5.60	7.51	6.98	6.51	6.92	6.76	6.58	6.29	6.53
M3	5.13	6.11	7.05	6.43	6.00	6.37	630	6.17	6.01	6.17
S1										
S2										
S3										
P1										
P2										
Mean	5.41	6.08	7.37	6.72	6.24	6.59	6.31	6.30	6.14	6.33

TABLE-5(B) MSPD MEANS FOR SWEETNESS SCORE OF LAL PERA.

		P1				P2			
		D1	D2	D3	D4	D1	D2	D3	D4
M1	S1	6.50	6.43	6.28	6.09	6.48	6.40	6.22	6.00
	S2	7.58	7.47	7.33	7.17	7.50	7.41	7.20	7.02
	S3	8.51	8.42	8.30	8.12	8.43	8.30	8.17	8.00
M2	S1	6.14	5.91	5.78	5.55	6.08	5.88	5.78	5.51
	S2	6.51	6.40	6.23	6.03	6.48	6.32	6.18	6.00
	S3	8.48	8.36	8.20	8.00	8.40	8.31	8.13	7.82
M3	S1	6.01	5.90	5.75	5.50	5.97	5.81	5.61	5.37
	S2	6.23	6.10	5.86	5.71	6.11	5.92	5.70	5.51
	S3	8.00	7.88	7.72	7.53	7.92	7.70	7.52	7.40

ABBREVIATIONS

M1= BUFFALO MILK
M2= COW MILK
M3= TONED MILK

S1=25% SUGAR
S2=30% SUGAR
S3=35% SUGAR

P1=POLYTHINE PACK.
P2=PARCHAMENT PAPER PACK.

Table-5 (C) ANOVA TABLE FOR SWEETNESS SCORE

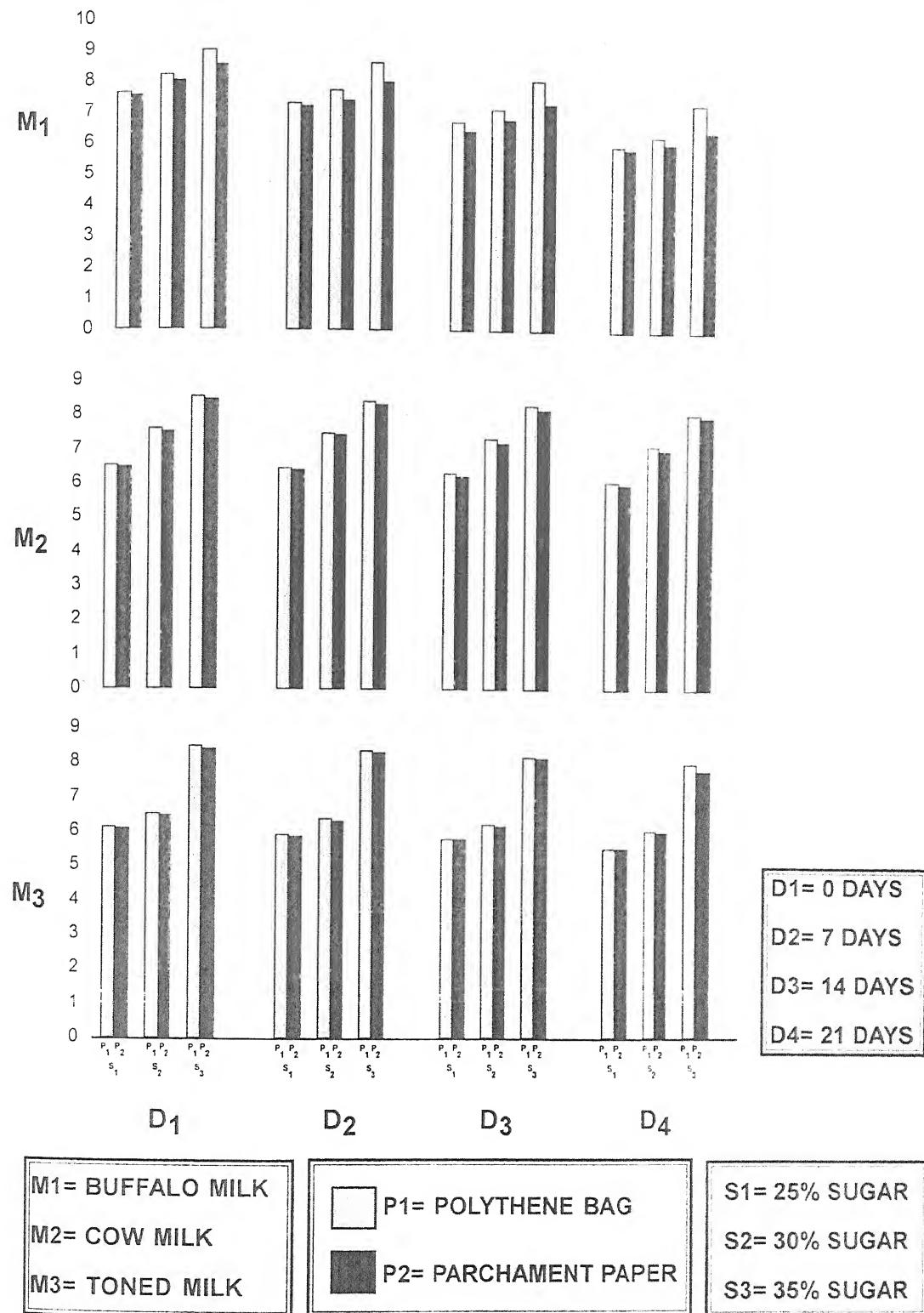
S.V.	D.f.	SS	MSS	F.Cal
M	2	27.0644	13.5322	304.78 **
S	2	173.1038	86.5519	1945.37 **
P	1	0.6959	0.6959	15.67 **
D	3	8.8768	2.9589	66.64 **
MxS	4	8.8481	2.2120	49.82 **
MxP	2	0.1793	0.0896	2.02 **
MxD	6	0.3509	0.0585	1.32 NS
SxP	2	0.1166	0.0583	1.31 NS
SxD	6	0.1775	0.0296	0.67 NS
PxD	3	0.3998	0.1333	3.00 *
MxSxp	4	0.2232	0.0558	1.26 NS
SxPxD	6	0.5012	0.0835	1.88 NS
MxPxD	6	0.5824	0.0971	2.19 NS
MxSxPxD	12	0.8256	0.0688	1.55 NS
Error	156	6.9235	0.0444	--

SE (M) SE (D) AND CD. TABLE

	M	S	P	D	MxS	MxP	MxD	SxP	SxD
SE(m)	0.025	0.025	0.020	0.029	0.043	0.035	0.050	0.035	0.050
SE(d)	0.035	0.035	0.028	0.041	0.061	0.049	0.071	0.049	0.071
CD(5%)	0.069	0.069	0.055	0.080	0.119	0.097	0.138	0.097	0.138

	PxD	MxSxP	SxPxD	MxPxD	MxSxPxD
SE(m)	0.041	0.043	0.070	0.070	0.122
SE(d)	0.057	0.061	0.099	0.099	0.172
CD(5%)	0.112	0.119	0.195	0.195	0.337

FIG.-5 EFFECT OF TYPES OF MILK, LEVELS OF SUGAR, PACKAGING MATERIALS AND PERIODS OF STORAGE ON THE SWEETNESS SCORE OF LAL PERA.



OVERALL ORGANOLEPTIC SCORE :

The comparison of the different combinations with respect to organoleptic scores of lal pera has been presented in table 6A & 6B and also illustrated in fig. 6.

From Table 6A , it is evident that the highest overall organoleptic score (78.82) was in case of pera made from buffalo milk khoa and the lowest overall organoleptic score from toned milk khoa.

The reason for superior overall organoleptic quality of Lal pera made from buffalo milk khoa was due to presence of high flavour smooth body and texture,good colour and appearance and best sweetness than the sample prepared from cow and toned milk khoa .

So far as the sugar level in concerned the highest overall organoleptic score (77.24) was in case of 35% sugar. The overall organoleptic quality of other levels of sugar was significantly inferior to that of 35% of sugar .

Present finding revealed that the pera made with 25% sugar decreased in organoleptic quality due to lower sweetness while the samples having 35% sugar level showed increased organoleptic quality.

Among the packing materials also a significantly higher score for overall organoleptic quality was observed in polythene (77.22) than parchamant paper (75.94).

As regards the periods of storage of pera it was observed that highest overall organoleptic score (79.75) was when it was fresh. After that the overall organoleptic quality significantly deteriorated with the increasing periods of storage at room temperature.

The storage of Lal pera at room temperature, indicated deterioration of overall organolptic quality which might be due to redution of moisture and microbial activity in pera during storage at room temperature.

From the table 6A showing means of types of milk and periods of storage (MxD treatment combinations) it was obvserve that the highest overall organoleptic score (82.52) was in case of fresh pera made from buffalo milk khoa ($M_1 D_1$) all the remaining treatment combinations of types of milk and storage periods (MxD) gave the overall organoleptic score significantly lower than that of fresh pera made from buffalo milk khoa ($M_1 D_1$). The lowest overall organaleptic score (64.51) was noted when the samples were stored for 21 days and made from toned milk khoa ($M_3 D_4$).

From means of levels of sugar and periods of storage (SxD) it was observed that the highest overall orgoanoleptic score (84.52) was obtained when the fresh samples were made with 35 %sugar ($S_1 D_1$). This was significantly higher than the average overall organoleptic score in case of the remaining treatment combinations the lowest overall organoleptic score (66.58) was noted when the samples contend least sugar and stored for longer periods($S_1 D_4$) at room temperature.

From Table 6-B, it is evident that the overall highest organoleptic score (92.69) was in case of fresh lal pera made form buffalo milk khoa having 35% sugar level in the polythene packing ($M_1 S_3 P_1 D_1$).

From Table 6-C, showing the analysis of variance of the overall organoleptic socre of different treatment combinations , it was observed

that there were highly significant difference among the types of milk (M), levels of sugar (S), types of packing material (P) and periods of storage at room temperature (D) of lal pera. All the four treatment combinations differed highly significantly at 0.1% level of significance. The first order interactions were found to be non-significant.

The findings led to the conclusion that fresh lal pera of good overall organoleptic quality can be prepared with 35% sugar from buffalo milk khoa.

TABLE-6 (A)

EFFECT OF TYPES OF MILK, LEVELS OF SUGAR, PACKAGING MATERIALS AND PERIODS OF STORAGE ON THE OVERALL ORGANOLEPTIC SCORE OF LAL PERA.

	S1	S2	S3	P1	P2	D1	D2	D3	D4	Mean
M1	75.11	78.12	83.00	81.00	80.00	82.52	80.00	76.66	73.00	78.82
M3	69.42	73.74	73.41	77.14	75.58	77.80	74.78	71.00	66.03	73.21
M3	66.43	70.28	75.32	73.09	71.56	74.98	72.01	68.52	64.51	70.74
S1										
S2										
S3										
P1										
P2										
Mean	70.32	74.05	77.24	77.22	75.94	79.75	77.50	73.96	69.81	75.65

TABLE-6(B)

MSPD MEANS FOR OVERALL ORGANOLEPTIC SCORE OF LAL PERA.

		P1				P2			
		D1	D2	D3	D4	D1	D2	D3	D4
M1	S1	84.14	82.56	80.40	72.14	84.00	82.01	79.92	76.83
	S2	86.79	85.14	83.00	79.88	86.14	84.82	82.38	79.44
	S3	92.69	91.69	89.70	86.56	92.50	91.42	89.32	86.12
M2	S1	78.00	76.69	74.58	71.33	77.59	76.40	74.50	71.14
	S2	81.99	80.18	77.98	74.52	81.70	80.00	77.52	74.13
	S3	86.56	84.87	82.56	79.01	86.12	84.50	82.01	78.52
M3	S1	75.00	73.08	70.50	67.01	74.58	72.72	70.10	66.58
	S2	78.92	76.98	74.52	71.00	78.48	76.88	74.06	70.53
	S3	84.06	82.08	79.50	76.00	83.58	81.59	79.00	75.40

ABBREVIATIONS

M1= BUFFALO MILK
 M2= COW MILK
 M3= TONED MILK

S1=25% SUGAR
 S2=30% SUGAR
 S3=35% SUGAR

P1=POLYTHINE PACK
 P2=PARCHAMENT PAPER PACK.

TABLE-6 (C) ANOVA TABLE FOR ORGANOLEPTIC SCORE

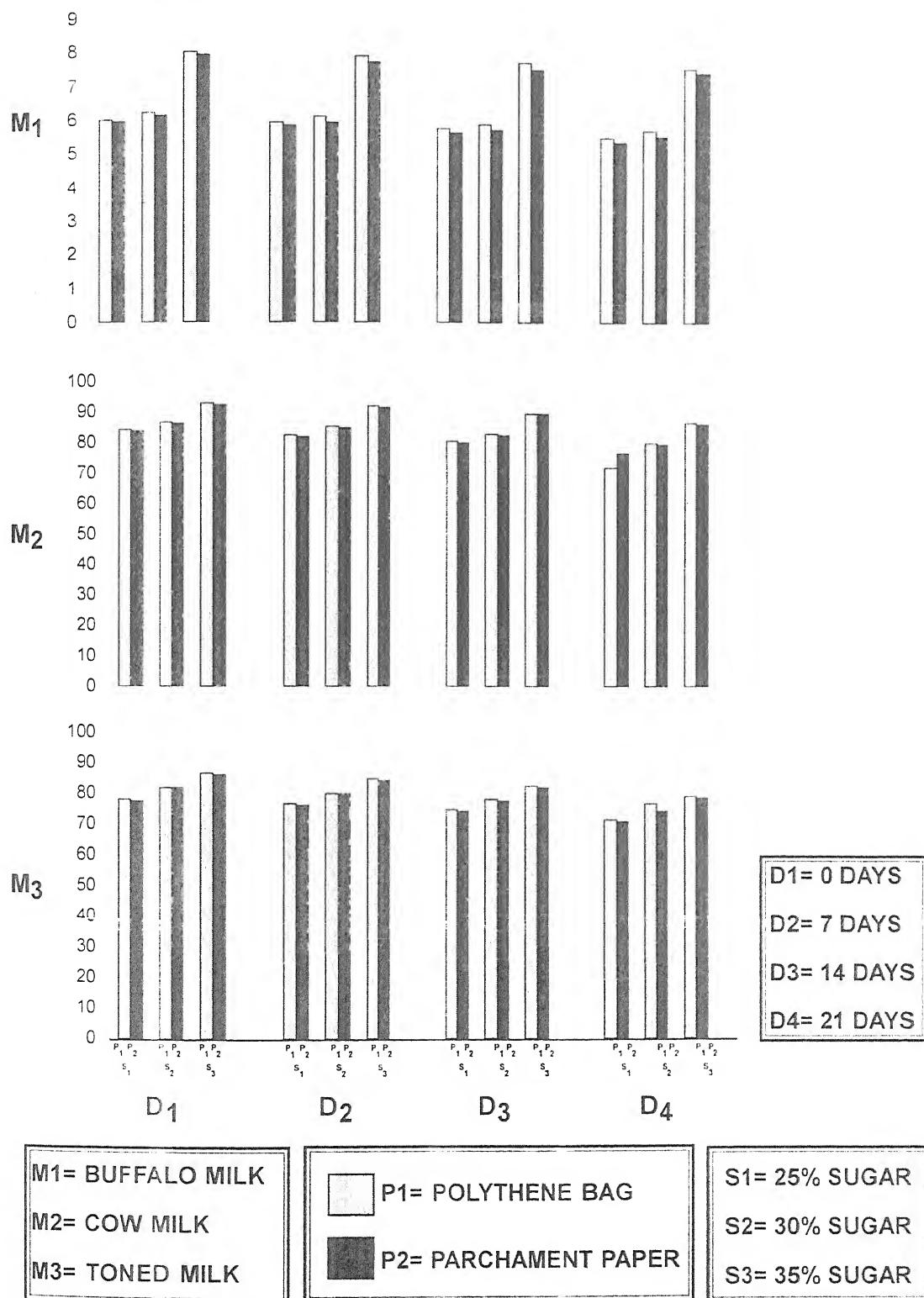
S.v.	D.f.	SS	MSS	F.Cal
M	2	3022.5550	1511.2775	715.39 **
S	2	2889.3730	1444.6865	683.87 **
P	1	3.4360	3.4360	1.63 NS
D	3	1759.2030	586.4010	277.59 **
MxS	4	33.1060	8.2765	3.92 **
MxP	2	2.0270	1.0135	0.48 NS
MxD	6	5.8060	0.9677	0.46 NS
SxP	2	2.9580	1.4790	0.70 NS
SxD	6	4.7960	0.7993	0.38 NS
PxD	3	2.8200	0.9400	0.44 NS
MxSxp	4	9.8250	2.4563	1.16 NS
SxPxD	6	10.1820	1.6970	0.80 NS
MxPxD	6	12.8250	2.1375	1.01 NS
MxSxPxD	12	15.1120	1.2593	0.60 NS
Error	156	329.5500	2.1125	--

SE (M) SE (D) AND CD. TABLE

	M	S	P	D	MxS	MxP	MxD	SxP	SxD
SE(m)	0.171	0.171	0.140	0.198	0.297	0.242	0.342	0.242	0.342
SE(d)	0.242	0.242	0.198	0.280	0.419	0.342	0.484	0.342	0.484
CD(5%)	0.475	0.475	0.388	0.548	0.822	0.671	0.949	0.671	0.949

	PxD	MxSxP	SxPxD	MxPxD	MxSxPxD
SE(m)	0.280	0.297	0.484	0.484	0.839
SE(d)	0.395	0.419	0.685	0.685	1.186
CD(5%)	0.775	0.822	1.343	1.343	2.326

FIG.-6 EFFECT OF TYPES OF MILK, LEVELS OF SUGAR, PACKAGING MATERIALS AND PERIODS OF STORAGE ON THE OVERALL ORGANOLEPTIC SCORE OF LAL PERA.



3- CHEMICAL CHARACTERISTICS OF LAL PERA :

A- TOTAL SOLIDS CONTENTS (%) :

The comparison of different combinations with respect to total solids content (%) of Lal Pera has been presented in table 7-A and 7-B and also illustrated in fig. 7.

From table 7-A, it is evident that the highest total solids content (86.35 %) was in case of Lal Pera made from cow milk Khoa and the lowest total solids contents (84.74 %) was in case of Lal pera made from buffalo milk Khoa.

The higher total solids content (%) in Lal Pera made from cow milk Khoa than Lal Pera made from buffalo milk Khoa were due to the reason that the cow milk Khoa contained higher percentage of total solids than buffalo milk Khoa prepared in the laboratory. The similar results were also reported by Narain and Singh (1981) & Parihar (1993).

So far as the impact of sugar level on total solids in concerned the highest total solids content (87.88 %) were obtained from 35 % sugar level, while the total solids % in case of 30 % and 25 % levels of sugar were observed to be significantly lower as compared to 35 % level of sugar.

The higher total solids content (%) in Lal pera samples made by the addition of 35 % sugar than 30% and 25% sugar levels, may be attributed to the lesser moisture content in comparison to other samples.

The results of present findings were more or less similar with the result of Prajapati et al. (1986) who reported that fresh labora-

tory made Khoa sample with 50 % sugar contained higher total solids 85.78 % then 30 and 40 % sugar levels.

The impact of packaging materials on total solids content (%) was evident by higher total solids content (%) in samples packed in the parchment paper. A higher total solids content (88.19%) was observed in Lal pera samples when packed in parchment then when packed in polythene (85.15 %). This might be due to the fact that parchment paper absorbed more moisture than the polythene pack.

As regards the periods of storage a lowest total solids content (38.38%) was noted when the samples were tested fresh. A significant increase in total solids content (%) was observed as the storage period increased which might again be due to the reason that the storage for a long period at room temperature reduced the moisture content (%) in pera samples which ultimately affected the total solids content (%) favourably.

The result of the present findings confirm with the result of Prajapati et al. (1986) who reported that fresh laboratory made Khoa sample mixed with sugar contained lowest total solids content (83.88 %). After that the total solids content (%) significantly increased with the increase in periods of storage at room temperature.

From table 7-B it was observed that the highest total solids content (96.07%) was found in Lal pera made from cow milk Khoa having 35% sugar packed in parchment paper and stored for 21 days ($M_2 S_3 P_2 D_4$). However, all other treatments showed non-significant differences.

From table 7-C, showing analysis of variance of the total solids content (%) of different treatment combinations, it was observed that there were highly significant differences among the types of milk (M), levels of sugar (S), packaging material s (P) and periods of storage at room temperature (D). All the four treatment combinations had significant differences, at 0.1 % level of significance and while , all the interactions was found to be non significant.

The result of present findings are more or less similar with the result of **Dwarikanath and Srikanta (1977)**, **Sharma and Zariwala(1978)**, **Patel and Gandhi (1980)** and **Garg et al. (1984)**, who reported total solids content as 88.7, 85-95.8,86.50 and 85.01 % in market Lal Pera samples respectivily.

The result of present findings do not confirm with the result of **Pal and Gupta (1987)**, Who reported lower total solids content (75.0%) in laboratory made Lal pera samples.

The present findings envisaged that higher total solids content in Lal pera samples could be obtained when prepared from buffalo milk khoa containing 35% sugar packed in parchment paper and stored for 21 days at room temperature.

TABLE-7 (A)

EFFECT OF TYPES OF MILK, LEVELS OF SUGAR, PACKAGING MATERIALS AND PERIODS OF STORAGE ON THE TOTAL SOLIDS CONTENT (%) OF LAL PERA.

	S1	S2	S3	P1	P2	D1	D2	D3	D4	Mean
M1	83.12	84.32	86.62	83.12	83.06	82.31	84.92	87.75	87.50	84.74
M3	85.52	86.68	86.01	85.42	85.51	84.52	87.13	88.01	88.36	86.35
M3	84.02	86.15	87.72	84.05	84.11	83.16	85.65	88.22	88.57	85.73
S1				83.01	83.12	81.55	84.01	86.25	86.62	84.09
S2				86.25	86.15	83.31	85.92	88.01	88.55	84.34
S3				86.84	86.52	85.12	87.62	90.11	91.12	87.88
P1					82.06	84.12	86.18	88.24	85.15	
P2					85.02	87.12	89.22	91.42	88.19	
Mean	84.22	85.71	86.78	84.78	84.74	83.38	85.81	87.96	88.79	86.06

TABLE-7 (A)

EFFECT OF TYPES OF MILK, LEVELS OF SUGAR , PACKAGING MATERIALS AND

PERIODS OF STORAGE ON THE TOTAL SOLIDS CONTENT (%) OF LAL PERA.

	S1	S2	S3	P1	P2	D1	D2	D3	D4	Mean
M1	83.12	84.32	86.62	83.12	83.06	82.31	84.92	87.75	87.50	84.74
M3	85.52	86.68	86.01	85.42	85.51	84.52	87.13	88.01	88.36	86.35
M3	84.02	86.15	87.72	84.05	84.11	83.16	85.65	88.22	88.57	85.73
S1				83.01	83.12	81.55	84.01	86.25	86.62	84.09
S2				86.25	86.15	83.31	85.92	88.01	88.55	84.34
S3				86.84	86.52	85.12	87.62	90.11	91.12	87.88
P1						82.06	84.12	86.18	88.24	85.15
P2						85.02	87.12	89.22	91.42	88.19
Mean	84.22	85.71	86.78	84.78	84.74	83.38	85.81	87.96	88.79	86.06

TABLE-7(B) MSPD MEANS FOR TOTAL SOLIDS CONTENT (%) OF LAL PERA.

		P1				P2			
		D1	D2	D3	D4	D1	D2	D3	D4
M1	S1	79.30 (62.94)	81.41 (64.47)	83.42 (65.98)	85.00 (67.21)	82.44 (65.25)	84.86 (67.09)	86.93 (68.81)	89.06 (70.66)
	S2	80.00 (63.44)	82.40 (65.20)	84.50 (66.81)	86.01 (68.05)	83.88 (66.32)	86.40 (68.36)	88.56 (70.22)	90.86 (72.38)
	S3	82.06 (64.92)	84.42 (66.76)	86.87 (68.74)	88.49 (70.16)	86.01 (68.05)	88.64 (70.31)	90.92 (72.52)	93.08 (74.70)
M2	S1	81.58 (64.56)	84.11 (66.52)	86.22 (68.21)	86.52 (68.46)	84.76 (66.99)	87.55 (69.34)	89.56 (71.12)	91.87 (72.70)
	S2	82.71 (65.44)	85.12 (67.31)	87.46 (69.25)	89.52 (71.12)	85.66 (67.74)	88.14 (69.85)	90.12 (71.68)	93.87 (75.65)
	S3	84.54 (66.77)	87.21 (69.06)	89.50 (71.09)	91.40 (72.95)	87.92 (69.69)	90.06 (71.58)	92.72 (74.36)	96.07 (78.52)
M3	S1	80.00 (63.44)	82.01 (64.92)	84.40 (66.74)	86.20 (68.19)	82.51 (65.30)	85.06 (67.24)	87.42 (69.25)	89.99 (71.54)
	S2	82.00 (64.90)	84.30 (66.66)	86.36 (68.31)	88.56 (70.22)	85.41 (67.56)	87.97 (69.67)	90.00 (71.56)	92.57 (74.18)
	S3	84.14 (66.53)	86.46 (68.38)	88.54 (70.20)	90.66 (72.19)	86.41 (68.39)	88.51 (70.20)	91.55 (73.11)	94.02 (75.86)

ABBREVIATIONS

M1= BUFFALO MILK
M2= COW MILK
M3= TONED MILK

S1= 25% SUGAR
S2= 30% SUGAR
S3= 35% SUGAR

P1= POLYTHINE PACK.
P2= PARCHAMENT PAPER PACK.

TABLE-7 (C) ANOVA TABLE FOR TOTAL SOLIDS CONTENT (%)

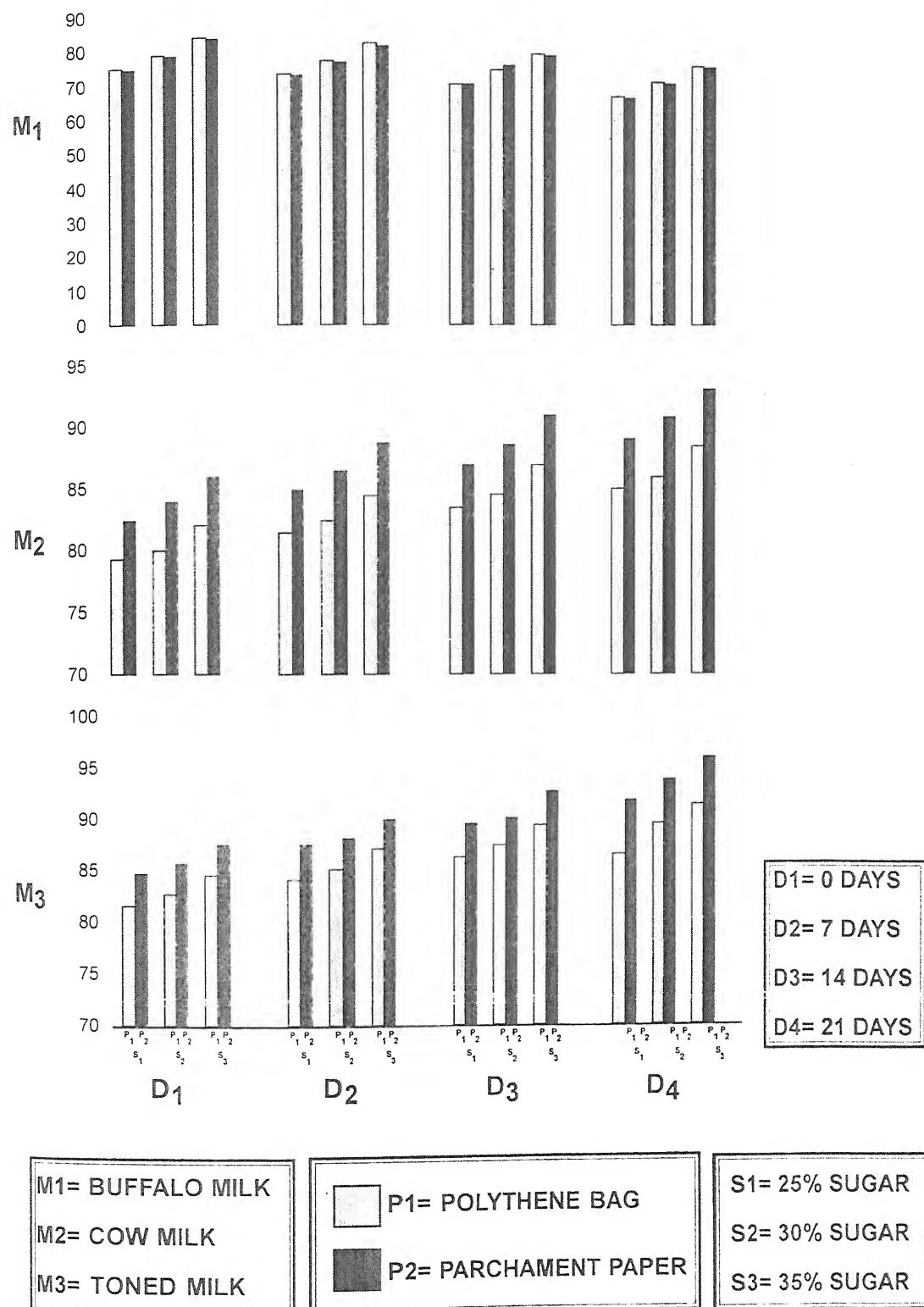
<i>S.V.</i>	<i>D.f.</i>	<i>SS</i>	<i>MSS</i>	<i>F.Cal</i>
M	2	160.087	80.0435	162.33 **
S	2	382.727	191.3635	388.01 **
P	1	519.405	519.4050	1053.35 **
D	3	1043.863	349.2777	708.35 **
MxS	4	7.036	1.7590	3.57 *
MxP	2	3.197	1.5985	3.24 *
MxD	6	5.516	0.9193	1.86 NS
SxP	2	2.458	1.2290	2.49 *
SxD	6	15.510	2.5850	5.24 **
PxD	3	23.093	7.6977	15.61 **
MxSxp	4	3.013	0.7533	1.53 NS
SxPxD	6	5.117	0.8528	1.73 NS
MxPxD	6	5.825	0.9708	1.96 NS
MxSxPxD	12	9.816	0.8180	1.65 NS
Error	156	76.925	0.4931	--

SE (M) SE (D) AND CD. TABLE

	M	S	P	D	MxS	MxP	MxD	SxP	SxD
SE(m)	0.0827	0.0827	0.0676	0.0956	0.1433	0.1170	0.1655	0.1170	0.1655
SE(d)	0.1170	0.1170	0.0955	0.1351	0.2027	0.1655	0.2340	0.1655	0.2340
CD(5%)	0.2293	0.2293	0.1873	0.2648	0.3972	0.3244	0.4587	0.3244	0.4587

	PxD	MxSxP	SxPxD	MxPxD	MxSxPxD
SE(m)	0.1351	0.1433	0.2341	0.2341	0.4054
SE(d)	0.1911	0.2027	0.3310	0.3310	0.5733
CD(5%)	0.3745	0.3972	0.6487	0.6487	1.1236

FIG.-7 EFFECT OF TYPES OF MILK, LEVELS OF SUGAR,
PACKAGING MATERIALS, AND PERIODS OF STORAGE
ON THE TOTAL SOLIDS CONTENT (%) OF LAL PERA.



B- PROTEIN CONTENT (%) :

The comparision of the diffrent commbinations with respect to protein content (%) of Lal pera has been presented in table 8-A and 8-B and also shown through fig. 8.

From table 8-A, it was observed that the highest protein content (15.12%) was noted in Lal pera sample made from cow milk khoa and lowest protein content (14.53%) was found in pera made from buffalo milk Khoa.

The present investgation revealed that the cow milk Khoa cotained higher percentage of protein than buffalo milk Khoa in laboratory made samples similar results were also reported by De (1980) and Narian and singh (1981) and Parihar (1993).

The impact of sugar shows that higher protein content (15.95%) were observed when the samples contained 25% sugar. The protein content was significantly lower in pera samples having 30% and 35 % sugar as compared to 25% sugar level.

Present findings revealed that the pera made with 25% sugar cotained higher protein (%) due to higher quantity of Khoa used per kg of the finished product than 30% and 35 % levels of sugars.

Among the packing materials, a significantly higher protein content in Lal pera (15.13%) was observed when the samples were packed in parchment paper as compared to polythene pack (14.68 %),may be due to more absorption of moisture by parchment paper.

As regards the effects of the periods of storage it was observed that fresh samples contained lowest protein %(14.41 %) but the pro-

tein content (%) significantly increased with the increase in periods of storage due to evaporation of moisture at room temperature.

From table 8-B, it was evident that Lal pera samples prepared from cow milk khoa with 25% sugar , packed in parchment paper and stored for 21 dayes contained the highest (16.98%) protein ($M_2 S_1 P_2 D_4$) followed by Lal Pera made from toned milk Khoa having 25% sugar , parchment paper pack and stored for 21 days ($M_3 S_1 P_2 D_4$) (16.89%), while cow milk Khoa having 25% sugar, parchment paper pack and stored for 14 days $M_2 S_1 P_2 D_3$ (16.61%),cow milk Khoa 25% sugar parchment paper pack and stored for 15 days $M_2 S_1 P_1 D_4$ (17.07%), toned milk khoa 25% sugar parchment paper pack and stored for 21 days $M_3 S_1 P_1 D_4$ (17.02%), fresh pera made from cow milk khoa having 25% sugar, the parchment paper pack $M_2 S_1 P_2 D_1$ (15.67%) and pera made from cow milk Khoa having 25% sugar level with parchment paper pack and stored for 14 days $M_2 S_1 P_1 D_3$ (16.73%) were statistically at par.

From table 8 C, showing analysis of variance for protein content of different treatment combinations. It was observed that there were highly significant differences among the types of milk (M),levels of sugar (S), types of packaging materials (P) and periods of storage at room temperature (D) of Lal pera. All the four treatment combination had significant variation at 0.1% level of significance.

The result of present finding corroborate with the results of Patel and Gandhi (1980) and Garg et al. (1984), who reported protein content of 19.50% and 13.77 % in market Lal pera samples respec-

tively.

The result of present finding did not agree with the result of Sharma and Zariwala (1978), who reported lower protein content (1.2-12.1%) in market Lal pera samples.

The findings led to the conclusion that highest protein content (%) could be obtained in Lal pera samples made from cow milk Khoa having 25% sugar with the polythene pack and stored for 21 days at room temperature.

TABLE-8 (A)

EFFECT OF TYPES OF MILK, LEVELS OF SUGAR, PACKAGING MATERIALS AND PERIODS OF STORAGE ON THE PROTEIN CONTENT (%) OF LAL PERA.

	S1	S2	S3	P1	P2	D1	D2	D3	D4	Mean
M1	15.12	14.92	14.12	14.90	15.25	13.75	14.13	14.42	14.24	14.53
M3	16.35	15.41	14.25	15.15	14.45	15.01	14.42	15.74	15.36	15.12
M3	14.84	14.56	13.52	13.98	15.12	14.79	15.16	14.43	15.25	14.62
S1				15.52	16.12	15.52	16.01	16.36	16.17	15.95
S2				15.25	15.42	14.41	14.64	15.12	15.02	14.97
S3				14.64	14.92	13.21	13.95	14.28	14.08	14.18
P1						14.21	14.58	15.01	14.92	14.68
P2						14.41	15.18	15.52	15.42	15.13
Mean	15.43	14.96	13.96	14.90	15.21	14.41	14.75	15.11	15.05	14.89

TABLE-8 (B) MSPD MEANS FOR PROTEIN CONTENT (%) OF LAL PERA.

		P1				P2			
		D1	D2	D3	D4	D1	D2	D3	D4
M1	S1	14.50 (22.38)	15.08 (22.83)	15.42 (23.16)	15.76 (23.38)	14.47 (22.35)	15.02 (22.81)	15.38 (23.08)	15.73 (23.38)
	S2	13.38 (21.43)	13.82 (21.85)	14.12 (22.12)	14.43 (22.34)	13.35 (21.45)	13.81 (21.85)	14.02 (22.00)	14.35 (22.27)
	S3	12.72 (20.92)	13.09 (21.18)	13.43 (21.53)	13.79 (21.79)	12.68 (20.85)	13.02 (21.15)	13.35 (21.43)	13.69 (21.69)
M2	S1	15.76 (23.39)	16.29 (23.78)	16.73 (24.16)	17.07 (24.39)	15.67 (23.30)	16.20 (23.73)	16.61 (24.07)	16.98 (24.32)
	S2	14.71 (22.58)	15.15 (22.92)	15.66 (23.30)	16.08 (23.63)	14.66 (22.50)	15.07 (22.85)	15.58 (23.23)	16.00 (23.58)
	S3	13.99 (21.95)	14.39 (22.28)	14.76 (22.60)	15.09 (22.85)	13.89 (21.87)	14.28 (22.19)	14.61 (22.48)	15.00 (22.79)
M3	S1	15.62 (23.28)	16.08 (23.62)	16.52 (24.01)	17.02 (24.37)	15.51 (23.22)	16.00 (23.58)	16.40 (23.89)	16.89 (24.24)
	S2	14.50 (22.38)	15.00 (22.79)	15.42 (23.16)	15.93 (23.53)	14.41 (22.33)	15.88 (23.47)	15.29 (23.00)	15.78 (23.38)
	S3	13.60 (21.64)	13.98 (21.95)	14.38 (22.27)	14.88 (22.68)	13.48 (21.51)	13.86 (21.84)	14.25 (22.19)	14.14 (22.12)

ABBREVIATIONS

M1=BUFFALO MILK
M2=COW MILK
M3=TONED MILK

S1=25% SUGAR
S2=30% SUGAR
S3=35% SUGAR

P1=POLYTHINE PACK.
P2=PARCHMENT PAPER PACK.

TABLE-8 (C) ANOVA TABLE FOR PROTEIN CONTENT (%)

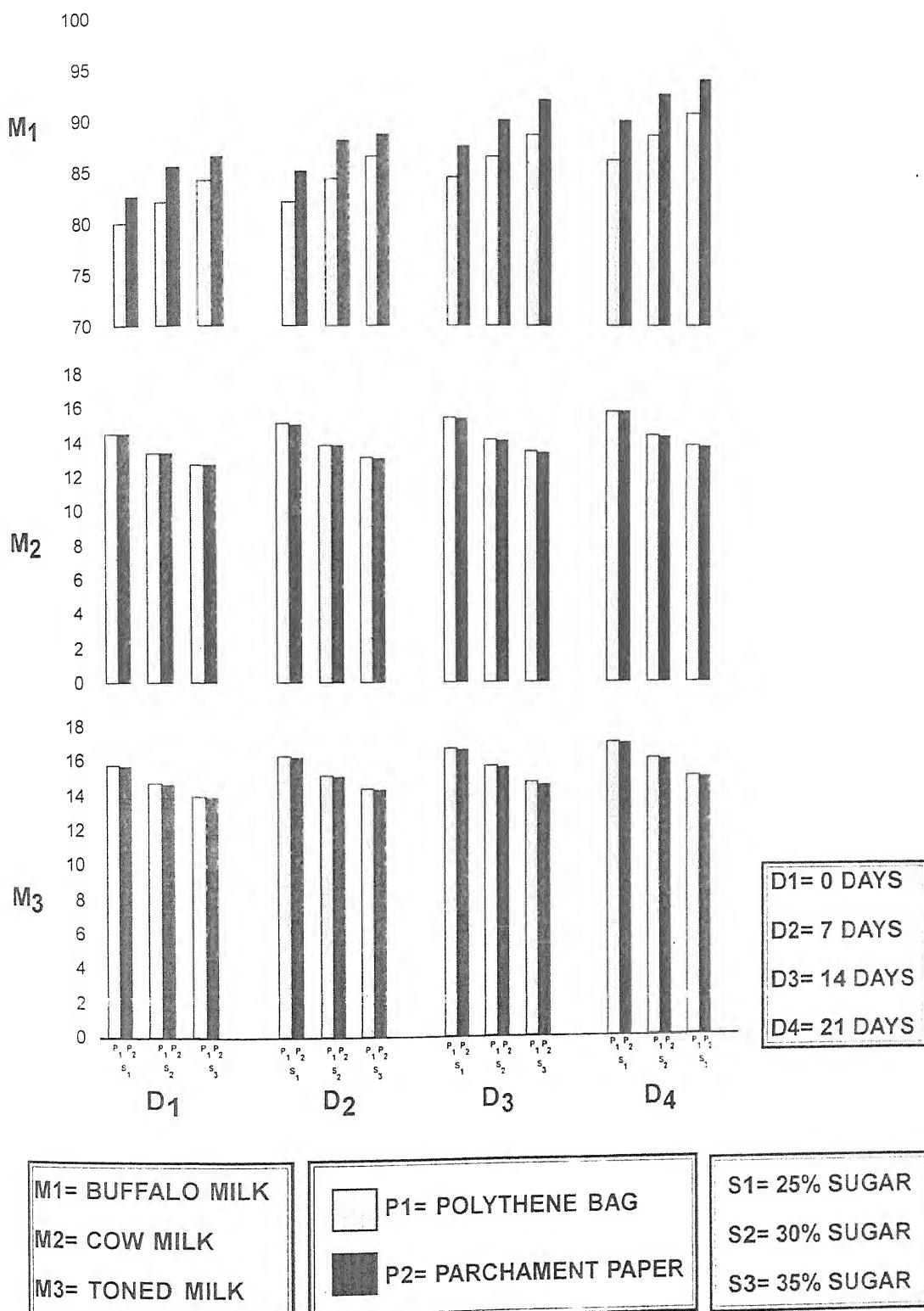
S.V.	D.f.	SS	MSS	F.Cal
M	2	46.6828	23.3414	532.91 **
S	2	95.0561	47.5281	1085.12 **
P	1	0.2460	0.2460	5.62 **
D	3	27.5402	9.1801	209.59 **
MxS	4	1.1083	0.2771	6.33 **
MxP	2	0.0083	0.0042	0.09 NS
MxD	6	0.1513	0.0252	0.57 NS
SxP	2	0.1244	0.0622	1.42 NS
SxD	6	0.3091	0.0515	1.18 NS
PxD	3	0.2036	0.0679	1.55 NS
MxSxp	4	0.2503	0.0626	1.43 NS
SxPxD	6	0.9982	0.1664	3.80 **
MxPxD	6	0.4735	0.0789	1.80 NS
MxSxPxD	12	0.5923	0.0494	1.12 NS
Error	156	6.8328	0.0438	--

SE (m) SE (d) AND CD. TABLE

	M	S	P	D	MxS	MxP	MxD	SxP
SE(m)	0.0247	0.0247	0.0201	0.0285	0.0427	0.0349	0.0493	0.0349
SE(d)	0.0349	0.0349	0.0285	0.0403	0.0604	0.0493	0.0697	0.0493
CD(5%)	0.0684	0.0684	0.0558	0.0789	0.1184	0.0967	0.1367	0.0967

	SxD	PxD	MxSxP	SxPxD	MxPxD	MxSxPxD
SE(m)	0.0493	0.0403	0.0427	0.0698	0.0698	0.1208
SE(d)	0.0697	0.0569	0.0604	0.0986	0.0986	0.1708
CD(5%)	0.1367	0.1116	0.1184	0.1933	0.1933	0.3349

FIG.-8 EFFECT OF TYPES OF MILK, LEVELS OF SUGAR, PACKAGING MATERIALS, AND PERIODS OF STORAGE ON THE PROTEIN CONTENT (%) OF LAL PERA.



C- FAT CONTENT (%) :

The comparision of the different combinations with respect to fat content (%) of lal pera has been presented in table 9-A and 9-B and also illustrated in fig. 9.

From table 9-A, it was observed that the highest fat content (22.40%) was found in lal pera samples made from buffalo milk Khoa and the lowest fat content (14.73%) was in case of lal pera made from toned milk Khoa.

The reason of higher fat content (%) in Lal pera samples made from buffalo milk Khoa than lal pera made from toned milk Khoa was the higher percentage of fat containind in buffalo milk than toned milk.

So far as the sugar levels are concerned, the highest fat content (22.00%) was observed in pera samples containing 25% sugar than samples containing 30% and 35% sugar,in which the fat content (%) was significantly lower to that of 25% level of sugar ,which may be attributed to higher total solids content (Khoa content) in lal pera as compared to 30% and 35% sugar levels.

Among the two packaging materials a significantly higher fat content in parchment paper pack (18.75%) was noted than polythene pack (18.07%).

As regards the periods of storage the lowest fat content (17.93%) was found when it was fresh. The fat content (%) of treated samples significantly increased with periods of storage due to evaporation of moisture at room temperature.

The highest fat content in lal pera (23.62 %) was noted when

the Lal pera sample made from buffalo milk Khoa having 25% sugar in parchment paper stored for 21 days $M_1 S_1 P_2 D_4$ followed by. The fat content noted in Lal pera sample made from buffalo milk Khoa having 25% sugar in parchment paper stored for 15 days $M_1 S_1 P_2 D_2$ (23.53%), followed by fat content were observed in the fresh sample made from buffalo milk Khoa having 25% sugar with parchment paper ($M_1 S_1 P_2 D_1$). All the four treatment combination were statistically at par.

From table 9-C, showing analysis of variance of the fat content (%) of the different treatment combinations, highly significant differences were noted among the types of milk (M) levels of sugar (S), types of packaging material (P) and periods of storage at room temperature (D) of Lal pera. All the four treatment combinations had significant variation at 0.1 % level of significance. All the interaction were found to be non-significant.

The result of present findings are more or less similar to the results of Sharma and Zariwala (1978), Patel and Gandhi (1980), and Pal and Gupta (1987), who reported a fat content (%) of 7.0 - 25%, 20.0% and 26.0% in market pera samples, respectively.

The findings led to the conclusion that higher fat content (%) could be obtained in Lal pera samples made from buffalo milk Khoa having 25% sugar polythine packing and stored for 21 days at room temperature.

TABLE-9 (A)

EFFECT OF TYPES OF MILK, LEVELS OF SUGAR, PACKAGING MATERIALS AND PERIODS OF STORAGE ON THE FAT CONTENT (%) OF LAL PERA.

	S1	S2	S3	P1	P2	D1	D2	D3	D4	Mean
M1	30.00	21.14	20.00	21.00	22.00	22.72	21.07	21.58	22.09	22.4
M3	20.14	18.42	17.19	18.13	19.33	18.00	18.78	19.22	19.83	18.78
M3	15.82	14.58	13.52	14.40	15.00	14.08	14.57	15.00	15.56	14.73
S1										
S2										
S3										
P1										
P2										
Mean	22.00	18.05	16.90	17.91	18.58	17.93	18.16	18.65	19.29	18.50

TABLE-9 (B) MSPD MEANS FOR FAT CONTENT (%) OF LAL PERA.

		P1				P2			
		D1	D2	D3	D4	D1	D2	D3	D4
M1	S1	22.01 (27.99)	22.63 (28.41)	23.00 (28.66)	23.62 (29.09)	21.98 (27.95)	22.60 (28.38)	22.88 (28.56)	23.53 (29.02)
	S2	20.14 (26.67)	20.56 (26.95)	21.20 (27.42)	21.88 (27.87)	20.06 (26.59)	20.50 (26.92)	21.11 (27.37)	21.77 (27.79)
	S3	19.00 (25.84)	19.40 (26.13)	19.88 (26.45)	20.56 (26.95)	18.91 (25.81)	19.29 (26.04)	19.77 (26.38)	20.42 (26.88)
M2	S1	19.44 (26.17)	20.00 (26.56)	20.60 (26.99)	21.22 (27.45)	19.36 (26.09)	19.90 (26.49)	20.48 (26.89)	21.10 (27.35)
	S2	17.52 (24.75)	18.00 (25.10)	18.52 (25.50)	19.08 (25.86)	17.43 (24.68)	17.88 (24.99)	18.38 (25.37)	18.92 (25.79)
	S3	16.42 (23.92)	17.00 (24.35)	17.62 (24.83)	18.23 (25.28)	16.30 (23.81)	16.86 (24.24)	17.45 (25.37)	18.06 (25.79)
M3	S1	15.00 (22.79)	15.40 (23.11)	15.88 (23.46)	16.44 (23.93)	14.91 (22.77)	15.29 (22.99)	15.75 (23.38)	16.30 (23.81)
	S2	14.06 (21.99)	14.48 (22.36)	14.99 (22.77)	15.51 (23.21)	13.98 (21.95)	14.40 (22.30)	14.85 (22.67)	15.35 (23.08)
	S3	13.00 (21.13)	13.42 (21.49)	13.88 (21.85)	14.41 (22.32)	12.91 (21.11)	13.30 (21.39)	13.68 (21.69)	14.17 (22.10)

ABBREVIATIONS

M1= BUFFALO MILK
M2= COW MILK
M3= TONED MILK

S1=25% SUGAR
S2= 30% SUGAR
S3= 35% SUGAR

P1=POLYTHINE PACK.
P2=PARCHAMENT PAPER PACK.

Table-9 (C)

ANOVA TABLE FOR FAT CONTENT (%)

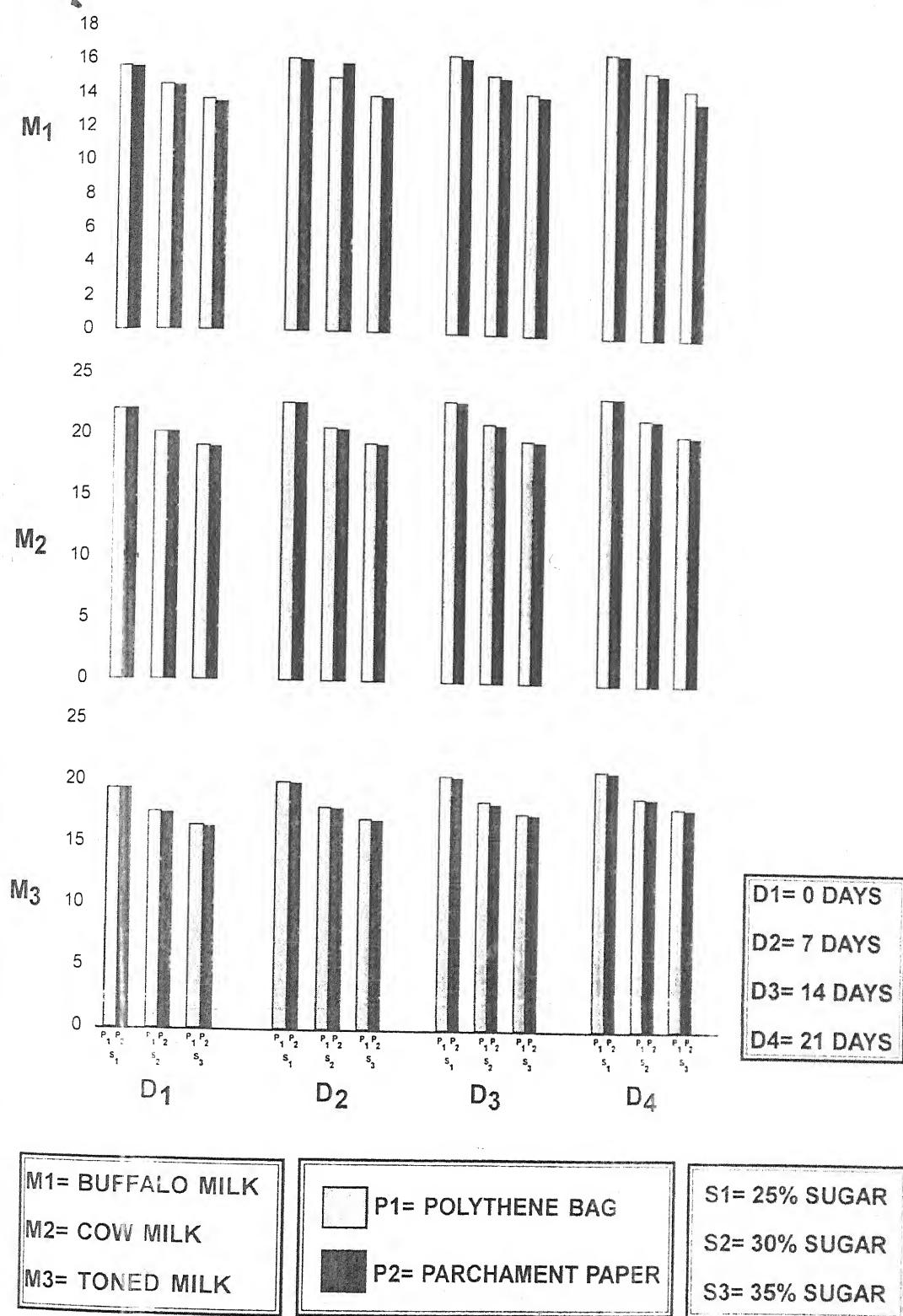
S.V.	D.f.	SS	MSS	F.Cal
M	2	865.2892	432.6446	3563.79 **
S	2	143.8383	73.9192	608.89 **
P	1	0.3926	0.3926	3.23 *
D	3	40.4137	13.4712	110.96 **
MxS	4	4.3185	1.0796	8.89 **
MxP	2	0.0152	0.0076	0.06 NS
MxD	6	0.1583	0.0264	0.22 NS
SxP	2	0.0053	0.0027	0.02 NS
SxD	6	0.0354	0.0059	0.05 NS
PxD	3	0.0237	0.0079	0.07 NS
MxSxP	4	0.0395	0.0099	0.08 NS
SxPxD	6	0.0519	0.0086	0.07 NS
MxPxD	6	0.0592	0.0099	0.08 NS
MxSxPxD	12	0.0984	0.0082	0.06 NS
Error	156	18.9325	0.1214	--

SE (m) SE (d) AND CD. TABLE

	M	S	P	D	MxS	MxP	MxD	SxP
SE(m)	0.0411	0.0411	0.0335	0.0474	0.0711	0.0581	0.0821	0.0581
SE(d)	0.0581	0.0581	0.0474	0.0670	0.1006	0.0821	0.1161	0.0821
CD(5%)	0.1138	0.1138	0.0929	0.1314	0.1971	0.1609	0.2276	0.1609

	SxD	PxD	MxSxP	SxPxD	MxPxD	MxSxPxD
SE(m)	0.0821	0.0671	0.0711	0.1161	0.1161	0.2012
SE(d)	0.1161	0.0948	0.1006	0.1642	0.1642	0.2844
CD(5%)	0.2276	0.1858	0.1971	0.3219	0.3219	0.5575

FIG.-9 EFFECT OF TYPES OF MILK, LEVELS OF SUGAR, PACKAGING MATERIALS, AND PERIODS OF STORAGE ON THE FAT CONTENT (%) OF LAL PERA.



D- SUCROSE CONTENT (%) :

The comparision of the different combination with respect to sucrose content (%) of lal pera has been presented in table 10-A and 10-B and illustrated in fig. 10.

From table 10-A, it was observed that the highest sucrose content (27.30%) was found in case of lal pera made from toned milk Khoa and lowest sucrose content (26.72%) was noted in case of lal pera made from buffalo milk Khoa.

The reason for differences in sucrose content (%) in lal pera prepared from different types of milk could not be ascertained but it might be due to reduced moisture content or low fat contents.

So far as the sugar level is concerned the highest sucrose content (32.67%) was in case of sample having 35% sugar while 30% and 25% levels of sugar showed significantly lower cotent (%) of sucrose as compared to 35 % level of sugar.

The present finding reveals that the lal pera made with 35% sugar contained highest sucrose (%) due to higher quantity of sugar mixed for its preparation than 30% and 25% levels of sugar.

Among the packaging materials, significantly higher sucrose content in lal pera (27.40%) was observed in the parchment paper than in polythene pack (26.48%).

The higher sucrose content (%) in pera in parchment paper pack (27.40%)was due to the evaportion of moisture as compared to polythene pack (26.48%).

As regards the periods of storage of lal pera, it was observed

that the lowest sucrose content (26.76%) when it was fresh. After that the sucrose content (%) significantly increased with the increasing periods of storage due to evaporation of moisture at room temperature.

From table 10-B it is evident that the highest sucrose content (32.90%) was in case of Lal pera made from toned milk Khoa having 35% sugar with polythene pack and stored for 14 days ($M_3 S_3 P_1 D_3$). Followed by pera made from cow milk Khoa having 35 % sugar level with parchment paper and stored for 14 days (32.76%) ($M_2 S_3 P_2 D_3$). Pera made from buffalo milk Khoa having 35% sugar level with polythene pack and stored for 21 days ($M_1 S_3 P_1 D_4$) (32.62%). Pera made from toned milk Khoa having 35% sugar level with polythene pack and stored for 21 days ($M_3 S_3 P_1 D_4$) (32.50%) and pera made from cow milk Khoa having 35% sugar level with polythene pack and stored 21 days ($M_2 S_3 P_1 D_4$) (32.54%). All the five treatments combinations were statistically at par.

From table 10-C of analysis of variance of the sucrose content (%) of the different treatment combinations, it was observed that there were highly significant differences among the three types of milk (M), different levels of sugar (S), two types of packaging material (P) and different periods of storage at room temperature (D) of lal pera. All the four treatment combinations had highly significant difference at 0.1% level of significance. All the interactions were found to have non significant differences.

The result of present findings are more or less similar to the result of Patel and Gandhi (1980), Garg et al. (1984) and Nasir et al.

(1987), who reported sucrose content of 31.86%, 37.50% and 33.75% of market pera samples, respectively.

The result of present findings are not in agreement with the findings of Dwarikanath and Srikanta (1977) and Shrma and Zariwala (1978) who reported very high and very low sucrose content i.e., 59.4% and 13.2-61.8% of market pera samples, respectively.

The findings led to the conclusion that highest sucrose content (%) was found in case of pera made from toned milk Khoa having 35% sugar with parchment paper pack and stored for 21 days at room temperature. No similar work has been reported by any worker.

TABLE-10 (A) EFFECT OF TYPES OF MILK, LEVELS OF SUGAR, PACKAGING MATERIALS AND PERIODS OF STORAGE ON THE SUCROSE CONTENT (%) OF LAL PERA.

	S1	S2	S3	P1	P2	D1	D2	D3	D4	Mean
M1	21.06	27.00	32.00	26.11	27.09	26.00	26.52	27.04	27.62	26.72
M3	21.32	27.11	32.59	26.43	27.43	26.40	27.00	27.62	28.28	27.13
M3	21.12	28.00	33.17	26.79	27.52	26.48	27.01	27.52	28.10	27.30
S1				21.00	21.54	20.73	21.20	21.80	22.50	21.46
S2				26.59	27.81	26.42	26.87	27.40	28.00	27.18
S3				32.06	33.11	32.00	32.40	32.92	33.52	32.67
P1						25.72	26.14	26.70	27.36	26.48
P2						26.76	27.14	27.56	28.14	27.40
Mean	21.17	27.37	32.59	26.50	27.42	26.31	26.79	27.32	27.94	27.04

TABLE-10 (B) MSPD MEANS FOR SUCROSE CONTENT (%) OF LAL PERA.

		P1				P2			
		D1	D2	D3	D4	D1	D2	D3	D4
M1	S1	20.11 (26.66)	20.55 (26.96)	21.00 (27.28)	21.56 (27.66)	20.05 (26.58)	20.45 (26.89)	20.82 (27.15)	21.29 (27.47)
	S2	25.50 (30.33)	25.96 (30.64)	26.44 (30.95)	27.00 (31.31)	25.45 (30.29)	25.89 (30.57)	26.34 (30.89)	26.84 (31.20)
	S3	31.00 (33.83)	31.42 (34.11)	31.96 (34.41)	32.62 (34.84)	30.94 (33.80)	31.35 (34.05)	31.84 (34.36)	32.50 (34.76)
M2	S1	20.52 (26.95)	21.00 (27.28)	21.56 (27.65)	22.14 (28.07)	20.47 (26.89)	20.90 (27.20)	21.44 (27.60)	22.00 (27.97)
	S2	26.00 (30.66)	26.42 (30.95)	26.88 (31.22)	27.44 (31.59)	25.93 (30.63)	26.35 (30.88)	26.75 (31.15)	27.30 (31.50)
	S3	31.00 (33.83)	31.40 (34.08)	31.96 (34.41)	32.54 (34.79)	30.91 (33.80)	31.29 (33.99)	31.81 (34.35)	32.37 (34.67)
M3	S1	20.14 (26.67)	20.52 (26.95)	21.06 (27.31)	21.67 (27.72)	20.06 (26.58)	20.42 (26.87)	20.92 (27.23)	21.51 (27.65)
	S2	26.49 (30.96)	26.92 (31.28)	27.42 (31.58)	28.02 (31.98)	26.41 (30.94)	26.81 (31.20)	27.29 (31.48)	27.86 (31.85)
	S3	32.00 (34.45)	32.40 (34.70)	32.90 (35.00)	32.50 (34.76)	31.93 (34.41)	32.28 (34.60)	32.76 (34.90)	32.32 (34.65)

ABBREVIATIONS

S1=25% SUGAR
S2=30% SUGAR
S3=35% SUGAR

M1=BUFFALO MILK
M2=COW MILK
M3=TONED MILK

P1=POLYTHINE PACK.
P2=PARCHAMENT PAPER PACK.

TABLE-10 (C) ANOVA TABLE FOR SUCROES CONTENT (%)

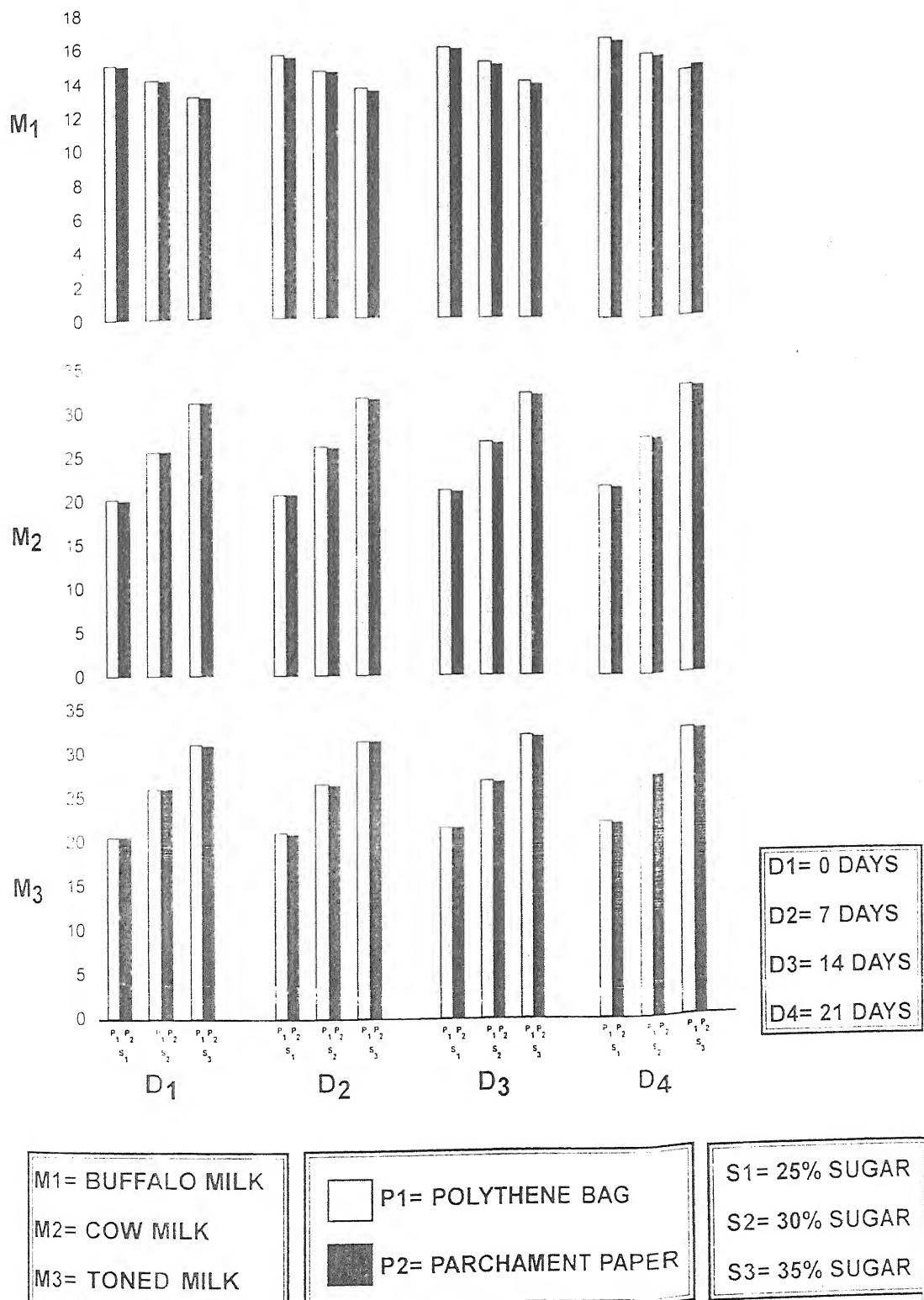
S.V.	D.f.	SS	MSS	F.Cal
M	2	4.8107	2.4054	13.42 **
S	2	1859.3395	929.6698	5187.89 **
P	1	0.3313	0.3313	1.85 NS
D	3	24.5564	8.1855	45.68 **
MxS	4	4.9778	1.2445	6.94 **
MxP	2	0.0016	0.0008	0.00 NS
MxD	6	0.3268	0.0545	0.30 NS
SxP	2	0.0037	0.0019	0.01 NS
SxD	6	0.5243	0.0874	0.49 NS
PxD	3	0.0281	0.0094	0.05 NS
MxSxp	4	0.0104	0.0026	0.01 NS
SxPxD	6	0.0414	0.0069	0.04 NS
MxPxD	6	0.0564	0.0094	0.05 NS
MxSxPxD	12	0.0972	0.0081	0.05 NS
Error	156	27.9536	0.1792	--

SE (M) SE (D) AND CD. TABLE

	M	S	P	D	MxS	MxP	MxD	SxP
SE(m)	0.0499	0.0499	0.0407	0.0576	0.0864	0.0705	0.0998	0.0705
SE(d)	0.0705	0.0705	0.0576	0.0814	0.1222	0.0998	0.1411	0.0998
CD(5%)	0.1383	0.1383	0.1129	0.1596	0.2395	0.1955	0.2765	0.1955

	SxD	PxD	MxSxP	SxPxD	MxPxD	MxSxPxD
SE(m)	0.0998	0.0815	0.0864	0.1411	0.1411	0.2444
SE(d)	0.1411	0.1152	0.1222	0.1995	0.1995	0.3456
CD(5%)	0.2765	0.2258	0.2395	0.3911	0.3911	0.6774

FIG.-10 EFFECT OF TYPES OF MILK, LEVELS OF SUGAR,
PACKAGING MATERIALS, AND PERIODS OF STORAGE
ON THE SUCROSE CONTENT (%) OF LAL PERA.



E- ASH CONTENT (%) :

The comparison of the different combinations with respect to ash content (%) of lal pera has been presented in Table 11-A and 11-B and also illustrated in Fig- 11.

From Table 11-A it is evident that the highest ash content (3.15%) was in case of lal pera from Toned milk khoa and the lowest ash content (2.84%) was in case of lal pera made from buffalo milk khoa.

The reason of higher ash content (%) in lal pera made from Toned milk khoa than lal pera made from buffalo milk khoa might be use of higher quantity of milk for preparation of khoa /kg sample which contained lower amount of S.N.F. and higher amount of salt as compared to other types of milk .

So for as the sugar level is concerned, the highest ash content (3.19%) was noted with 25% sugar level, while in case of 30% and 35% levels of sugar the ash content (%) was significantly lower than 25% level of sugar .

Present finding revealed that the pera made with 25% sugar level contained higher ash content (%) due to higher quantity of khoa used /kg of the finished product than 30% and 35% levels of sugar.

Among the two packaging materials a significantly higher ash content (3.14%) in lal pera samples was observed with parchment paper pack than polythene pack (2.96%).

The reason behind this fact might be that be parchment paper absorbed more water from the sample than the polythene pack which ultimately increased the total solids and ash content (%) of the samples.

As regards the effect of periods of storage on ash contents of lal pera samples it was observed that lowest ash contents (3.00%) was noted when the samples were fresh .The ash content (%) significantly increased with increasing periods of storage due to evaporation of moisture at room temperature.

From Table 11-B , It was observed that the highest ash content (3.49) was noted in lal pera samples made form Toned milk khoa having 25% sugar leval with parchment paper pack and stored for 21 days at room temperature ($M_3 S_1 P_2 D_4$). However, all other treatments showed non-significant differences among themselves.

From Table 11-C showing, analysis of variance of the ash content (%) of the different treatment combinations, it was observed that there were highly significant differences among the types of milk (M), levels of sugar (S) packaging materials (P) and periods of storage (D) of Lal pera at room temperature. All the four treatment combinations were significantly different at 5% level of significance and 0.1% level of significance . All the interactions were found to be non significant d.

The findings led to the conclusion that highest ash content(%) was obeained in pera samples made from Toned milk khoa having 25% sugar with parchment paper and stored for 21 days at room temperature.

TABLE-11(A) EFFECT OF TYPES OF MILK, LEVELS OF SUGAR, PACKAGING MATERIALS AND PERIODS OF STORAGE ON THE ASH CONTENT (%) OF LAL PERA.

	S1	S2	S3	P1	P2	D1	D2	D3	D4	Mean
M1	3.00	2.80	2.58	2.72	2.92	2.77	2.86	2.93	3.02	2.84
M3	3.26	3.08	2.98	3.00	3.08	3.00	3.09	3.17	3.28	3.10
M3	3.40	3.18	2.92	3.06	3.22	3.02	3.11	3.20	3.31	3.15
S1				3.08	3.28	3.11	3.19	3.27	3.38	3.19
S2				2.88	2.88	3.09	2.96	3.04	3.12	3.21
S3				2.72	2.72	2.86	2.73	2.80	2.91	3.03
P1						2.83	2.90	3.00	3.12	2.96
P2							3.00	3.09	3.19	3.29
Mean	3.22	3.02	2.86	2.91	3.07	2.92	3.01	3.09	3.20	3.02

TABLE-11 (B) MSPD MEANS FOR ASH CONTENT (%) OF LAL PERA.

		P1				P2			
		D1	D2	D3	D4	D1	D2	D3	D4
M1	S1	2.78 (9.55)	2.89 (9.78)	2.96 (9.92)	3.00 (9.98)	2.75 (9.52)	2.87 (9.74)	2.93 (9.85)	2.95 (9.87)
	S2	2.60 (9.28)	2.69 (9.42)	2.76 (9.58)	2.82 (9.70)	2.57 (9.21)	2.63 (9.32)	2.69 (9.42)	2.78 (9.55)
	S3	2.38	2.48	2.55	2.61	2.30	2.43	2.50	2.55
M2	S1	(8.85)	(9.05)	(9.20)	(9.33)	(8.72)	(8.97)	(9.10)	(9.20)
	S2	3.00	3.09	3.17	3.23	2.96	3.01	3.11	3.17
	S3	(9.98)	(10.02)	(10.25)	(10.37)	(9.90)	(10.02)	(10.15)	(10.25)
M3	S1	2.90	2.99	3.07	3.13	2.83	2.87	3.00	3.02
	S2	(9.50)	(9.65)	(9.73)	(10.05)	(10.19)	(9.70)	(9.74)	(10.09)
	S3	2.72	2.81	2.88	2.94	2.63	2.73	2.79	2.90
S1	S2	(10.40)	(10.52)	(10.69)	(10.71)	(10.31)	(10.47)	(10.58)	(10.63)
	S3	2.96 (9.90)	3.05 (10.09)	3.12 (10.18)	3.18 (10.27)	2.90 (9.81)	3.00 (9.98)	3.02 (10.01)	3.10 (10.14)
	S1	2.74 (9.52)	2.82 (9.68)	2.89 (9.92)	2.95 (9.90)	2.66 (9.38)	2.78 (9.55)	2.80 (9.63)	2.88 (9.78)

ABBREVIATIONS

S1=25% SUGAR
 S2=30% SUGAR
 S3=35% SUGAR

P1=POLYTHINE PACK
 P2=PARCHMENT PAPER PACK

M1=BUFFALO MILK
 M2=COW MILK
 M3=TONED MILK

TABLE-11 (C) ANOVA TABLE FOR ASH CONTENT (%)

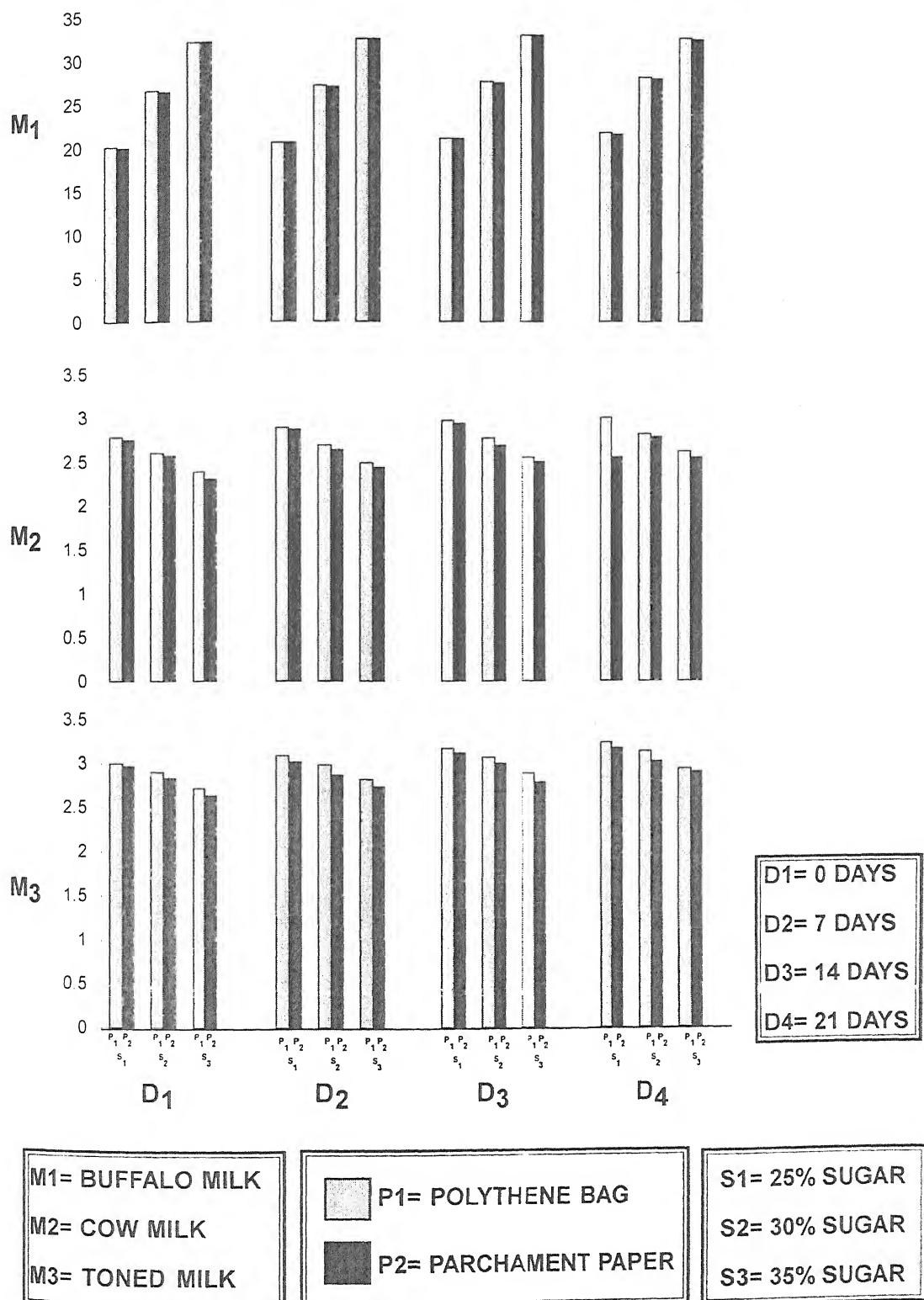
S.V.	D.f.	SS	MSS	F.Cal
M	2	16.82662	8.41331	1054.30 **
S	2	17.39409	8.69705	1089.86 **
P	1	0.66333	0.66333	83.12 **
D	3	4.56103	1.55034	194.28 **
MxS	4	0.99055	0.24764	31.03 **
MxP	2	0.00732	0.00366	0.46 NS
MxD	6	0.06440	0.01073	1.34 NS
SxP	2	0.03980	0.01990	2.49 *
SxD	6	0.04893	0.00816	1.02 NS
PxD	3	0.01474	0.00491	0.62 NS
MxSxp	4	0.00925	0.00231	0.29 NS
SxPxD	6	0.01023	0.00171	0.21 NS
MxPxD	6	0.02105	0.00351	0.44 NS
MxSxPxD	12	0.04925	0.00410	0.51 NS
Error	156	1.24488	0.00798	---

SE (M) SE (D) AND CD. TABLE

	M	S	P	D	MxS	MxP	MxD	SxP
SE(m)	0.0105	0.0105	0.0086	0.0121	0.0182	0.0149	0.0211	0.0149
SE(d)	0.0148	0.0148	0.0121	0.0172	0.0258	0.0292	0.0298	0.0292
CD(5%)	0.0292	0.1383	0.0238	0.0337	0.0505	0.0572	0.0583	0.0572

	SxD	PxD	MxSxP	SxPxD	MxPxD	MxSxPxD
SE(m)	0.0211	0.0172	0.0182	0.0298	0.0298	0.0516
SE(d)	0.0298	0.0243	0.0258	0.0421	0.0421	0.0729
CD(5%)	0.0572	0.0476	0.0505	0.0825	0.0825	0.1429

**FIG.-11 EFFECT OF TYPES OF MILK, LEVELS OF SUGAR,
PACKAGING MATERIALS, AND PERIODS OF STORAGE
ON THE ASH CONTENT (%) OF LAL PERA.**



4- MICROBIOLOGICAL QUALITIES OF LAL PERA :

A- STANDARD PLATE COUNT/GM :

The comparison of the different combinations with respect to standard plate count per gm of pera has been prosented in Table 12-A and 12-B and also illustrated in Fig. 12.

From Table 12-A , it is evident that the lowest standard plate count (37602/gm) was in case of lal pera made from Toned milk khoa and the highest standard plate count (3685/gm) was in case of lal pera made from buffalo milk khoa.

The reason of lower standard plate count per gm in lal pera made from Toned milk khoa than lal pera made from buffalo milk khoa might be due to presence of low moisture in lal pera made form toned milk khoa.

So for as the sugar level is concrned, The lowest standard plate count (38599/gm) was in case of 35% sugar level, while in case of 30% and 25% levels of sugar the standard plate count/gm was significantly higher than that of 35% level of sugar.

The sugar level (35%) clearly had the preserving effect on bacterial count/gm therefore, lowest standard plate count/gm was found in lal pera samples containing 35% sugar and higher standard plate count/gm was noted when the samples were treated with 30 and 25% sugar.

Prajapati et al. (1986) also reported that standard plate count per gm decreased significantly with the increase in amounts of sugar with khoa.

Among the packaging materials, a significantly lower standard plate count (51030/gm) was observed with parchment paper pack than polythene pack (56194/gm).

The reason of higher standard plate count/gm in lal pera sample in polythene pack Than parchment paper pack to presence of higher moisture in lal pera packed in polythene pack.,.

As regards the periods of storage of lal pera, the lowest standard plate count (13824/gm) was found when it was fresh .After that the standard plate count/gm increased significantly with the increasing periods of storage at room temperature, due to growth of different types of micro-organisms at room temperature on storage for longer periods.

Prajapati et al. (1986) also reported that in khoa mixed with sugar the standard plate count/gm significantly increased with the increase in periods of storage at room temperature.

From the tabel 12-A showing, means of levels of sugar and periods of storage (SxD treatment combinations), it was observed that the lowest standard plate count (13201/gm) was in case of fresh lal pera having 35% sugar ($S_3 D_1$) . All other treatment combinations with regard to level of sugar and storage periods (SxD) gave significantly higher standard plate count than that of fresh Lal pera having 35% le sugar ($S_3 D_1$). The highest standard plate count (120213/gm) was noted when the samplees were prepared with 25% sugar level and stored for 21 days at room temperature ($S_1 D_4$).

From Table 12-B , it was clear that the lowest standard plate

count (12521/gm) was in case of fresh lal pera made from toned milk khoa having 35% sugar packed in parchment paper ($M_3S_3P_2D_1$). However, all other treatment combinations showed non-significant differences among themselves.

From Table 12-C showing, analysis of variance of standard plate count/gm of different treatment combinations, it was observed that highly significant differences were noted among the types of milk (M) levels of sugar (S) packaging materials (P) and periods of storage at room temperature(D) of lal pera. All the four treatment combinations had significant variation at 0.1% level of significance. All other interactions differed significantly at 0.1% level of significance, . The significant interactions indicated that the differential effect of the two levels of one factor changes with the change in the level of other factors.

The results of the present findings are more or less similar with the results of Patel and Gandhi (1980), Parihar (1993), who reported standard plate count to be (12000-21000/gm) in freshly prepared pera samples.

The results of the present findings do not confirm to the results of Ghodekar et al. (1974) Kamat and Sulebele (1974), Singh et al. (1975). Garg and Mandokhot (1984) and Gautam and Lavania (1987) who reported very high range of standard plate count per gm of different market pera samples.

The findings led to the conclusion that lowest standard plate count/gm may be obtained in fresh lal pera made from toned milk khoa having 35% sugar with parchment paper pack.

TABLE-12 (A) EFFECT OF TYPES OF MILK, LEVELS OF SUGAR , PACKAGING MATERIALS AND PERIODS OF STORAGE ON THE STANDARD PLATE COUNT/GM OF LAL PERA.

	S1	S2	S3	P1	P2	D1	D2	D3	D4	Mean
M1	43723	34695	23776	34322	30221	16222	30121	58121	116211	36851.44
M3	43568	31875	21278	33020	29012	15121	28251	56012	112561	36853.33
M3	40012	31122	19500	30001	27481	13003	25121	50968	101212	37602.22
S1				43625	40342	16121	32692	64597	120213	52931.67
S2				33015	30120	15217	29159	60691	118698	47816.67
S3				21000	20111	13201	25293	50593	101396	38599.00
P1						14387	29852	60351	120187	56194.25
P2						13824	26782	54127	109387	51030.00
Mean	42434.33	32564.00	21518.00	32497.16	29547.83	14637.00	28408.88	50107.5	112483.13	44735.07

TABLE-12 (B) MSPD MEANS FOR TOTAL PLATE COUNT/GM OF LAL PERA.

		P1				P2			
		D1	D2	D3	D4	D1	D2	D3	D4
M1	S1	17231	43511	108787	256396	18012	44121	112990	260192
	S2	15968	31596	63125	126125	16082	31296	60296	118296
	S3	14992	24876	37026	55296	14492	21296	30192	45194
M2	S1	15888	40296	100529	251252	16762	40129	101296	249296
	S2	14892	30021	59961	118296	15292	31292	62722	124961
	S3	13332	20321	31296	45298	14029	21296	31969	44293
M3	S1	14900	37002	92969	224563	15296	37692	94395	235296
	S2	13350	26762	53293	106982	14291	29006	57692	114529
	S3	12521	16969	25316	37963	13692	19269	28565	43969

ABBREVIATIONS

M1= BUFFALO MILK
M2= COW MILK
M3= TONED MILK

S1=25% SUGAR
S2=30% SUGAR
S3=35% SUGAR

P1=POLYTHINE PACK.
P2=PARCHAMENT PAPER PACK.

TABLE-12 (C) ANOVA TABLE FOR TOTAL PLATE COUNT / GM

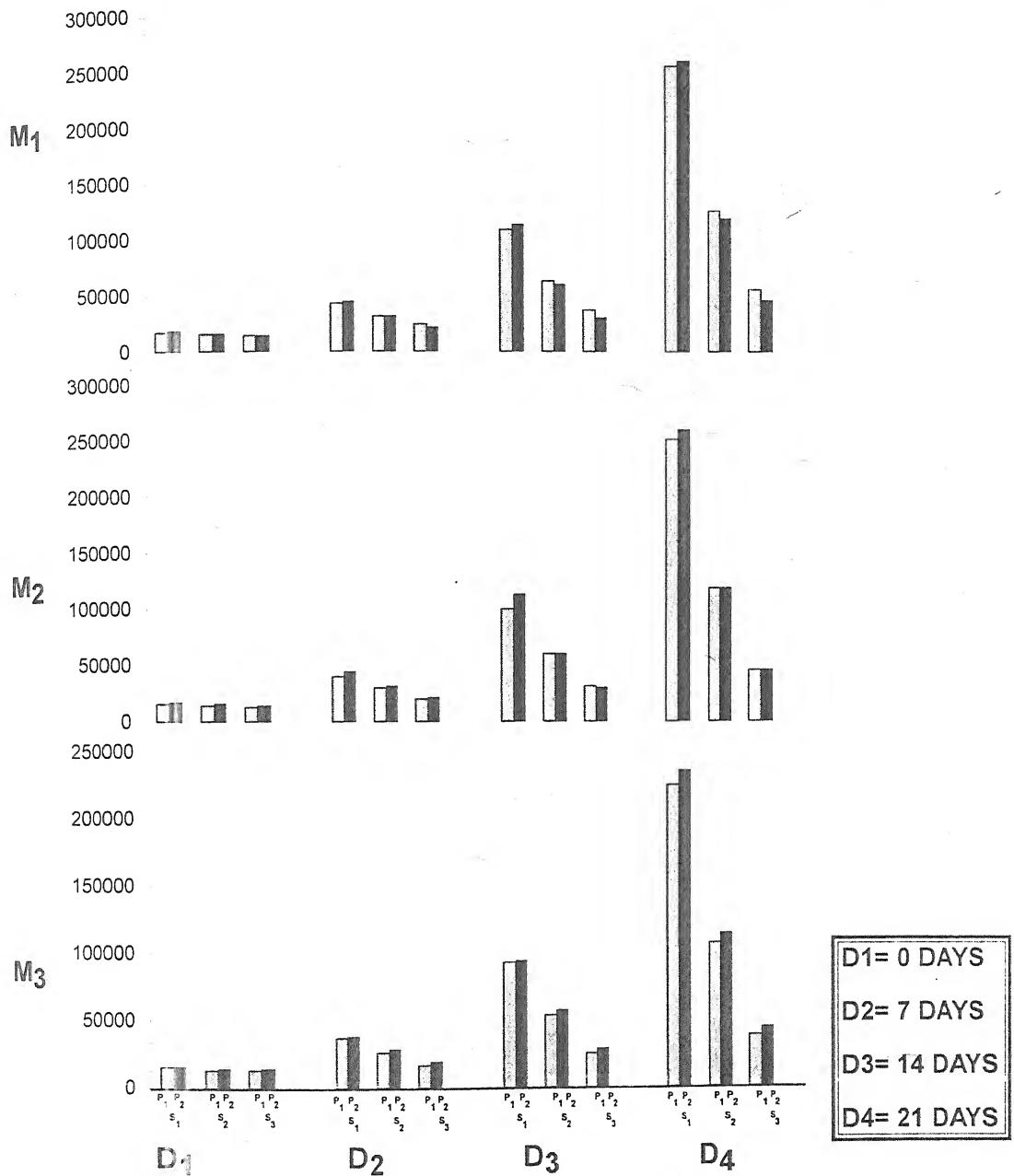
S.v.	D.f.	SS	MSS	F.Cal
M	2	2592519600.00	1296259800.00	4540.01 **
S	2	1984515554000.00	99225777000.00	347527.75 **
P	1	38981800.00	38981800.00	136.53 **
D	3	473465919000.00	157821973000.00	552754.71 **
MxS	4	535124400.00	133781100.00	468.55 **
MxP	2	253167500.00	126583750.00	443.35 **
MxD	6	1144521400.00	190753566.60	668.09 **
SxP	2	57983200.00	28991600.00	101.54 **
SxD	6	223249281000.00	37208213500.00	130317.82 **
PxD	3	281876200.00	93958733.33	329.08 **
MxSxp	4	1822000.00	455500.00	1.59 NS
SxPxD	6	12935343.00	2155890.50	7.55 **
MxPxD	6	13824563.00	2304093.83	8.07 **
MxSxPxD	12	14003512.00	1166959.33	4.09 **
Error	156	44540964.00	285519.00	--

SE (M) SE (D) AND CD. TABLE

	M	S	P	D	MxS	MxP	MxD	SxP
SE(m)	62.97	62.97	51.42	72.71	109.07	89.06	125.94	89.06
SE(d)	89.04	89.04	72.70	102.82	154.23	125.93	178.09	125.93
CD(5%)	174.52	174.52	142.50	201.52	302.28	246.81	349.05	246.81

	SxD	PxD	MxSxP	SxPxD	MxPxD	MxSxPxD
SE(m)	125.94	102.83	109.07	178.11	178.11	308.50
SE(d)	178.09	145.41	154.23	251.85	251.85	436.22
CD(5%)	349.05	284.99	302.28	493.63	493.63	854.99

**FIG.-12 EFFECT OF TYPES OF MILK, LEVELS OF SUGAR,
PACKAGING MATERIALS, AND PERIODS OF STORAGE
ON THE STANDARD PLATE COUNT/GM OF LAL PERA.**



M1= BUFFALO MILK
M2= COW MILK
M3= TONED MILK

P1= POLYTHENE BAG
P2= PARCHAMENT PAPER

S1= 25% SUGAR
S2= 30% SUGAR
S3= 35% SUGAR

B- YEASTS AND MOULDS COUNT/GM :

The comparison of the different combinations with respective yeasts and moulds count/gm of lal pera has been presented in Table 13-A and 13-B and fig. 13 and also photo A and B.

From Table 13-A it is evident that the lowest yeasts and moulds count (16.00/gm) was in case of lal pera made from Toned milk khoa and the highest yeasts and moulds count (21.30/gm) was in case of pera made from buffalo milk khoa.

The reasons of lower yeasts and moulds count/gm in lal pera made from Toned milk khoa than lal pera made from buffalo milk khoa might be the presence of low moisture in lal pera made from toned milk khoa.

So far as the sugar level is concerned the lowest yeast and mould counts (16.68/gm) were observed with 35% sugar level, while in case of samples having 30% and 25% levels of sugar the yeasts and moulds count/gm were significantly higher than that at 35% level of sugar .

Highere sugar level had a preserving effect and therefore the yeast and mould count of treated samples was found to be adversely related to the level of sugar added to Khoa for the preparation of lal pera.

Prajapati et al. (1986) also found that yeasts and moulds count/gm decreased significantly with increasing levels of sugar mixed with khoa.

Among the packaging materials, a significantly lower yeasts and

moulds count (21.39/gm) was observed with parchment paper pack than polythene pack.

The reason of higher yeast and mould count/gm lal pera with polythine pack than parchment paper pack presence of higher moisture in Lal pera, .

As regards the periods of storage of Lal pera the lowest yeasts and moulds count (5.47) was found when the samples were fresh. After that the yeasts and moulds count/gm increased significantly with the increase in periods of storage at room temperature, This might be due to the growth of yeasts and moulds at room temperatures when the samples were stored for longer periods.

Prajapati et al. (1986) also reported that yeasts and moulds count/gm in khoa mixed with sugar significantly increased with the increasing periods of storage at room temperature.

From the Table 13-A showing means of types of milk and packaging materials (MxP treatment combination), it was observed that the lowest yeast and moulds count (9.81/gm) was in case of lal pera made from toned milk khoa with parchment paper pack ($M_3 P_2$). All the remaining treatment combinations of types of milk and packaging materials (MxP) gave significantly higher yeasts and moulds count per gm than that of pera made from toned milk khoa. with parchment paper pack ($M_3 P_2$). The highest yeasts and moulds count (17.20/gm) was in case of pera made form buffalo milk khoa with polythene pack ($M_1 P_1$).

From means of levels of sugar and periods of storage (SxD) it

was observed that the lowest yeast and mould count were found (5.43/gm) in case of fresh lal pera and this was significantly lower than the average yeast and mould count/gm in other treatment combinations. The highest yeast and mould count (58.32/gm) was observed with 25% sugar at 21 days storage ($S_1 D_4$)

Table 13-B reflected that the lowest yeast and mould count (3.52/gm) was noted in fresh samples of lal pera made from Toned milk khoa having 35% sugar with parchment paper pack ($M_3 S_3 P_2 D_1$). However all other treatment showed non-significant differences among themselves.

From Table 13-C depicting analysis of variance of yeasts and moulds count/gm of the different treatment combinations it was observed that there were highly significant differences among the types of milk (M) levels of sugar (S) packaging materials (P) and periods of storage at room temperature (D) of lal pera. All the four treatment combinations differed significantly at 0.1% level of significance. The first order interactions MxP and SxD differed significantly at 5% and 0.1% levels of significance respectively. The remaining first order, all second orders and third order interactions were found to be non-significantly different non significantly. The significant interactions indicated that the differential effect of the two levels of one factor changes with the change in the level of other factor.

The results of the present findings are more or less similar/with the results of Garg and Mandokhot (1984) who reported less number of yeasts and moulds count/gm in market pera samples.

The results of the present findings do not confirm the results of Singh et al. (1975), Ghodekar et al. (1980) and Gautam and Lavania (1975) Who reported very high range of yeasts and moulds count/gm in different market pera samples.

The findings led to the conclusion that lowest yeasts and moulds count/gm may be obtain in fresh pera made from Toned milk khoa having 35% sugar with parchment paper pack.

TABLE-13 (A) EFFECT OF TYPES OF MILK, LEVELS OF SUGAR, PACKAGING MATERIALS AND PERIODS OF STORAGE ON THE YEAST AND MOULDS COUNT/GM OF LAL PERA.

	S1	S2	S3	P1	P2	D1	D2	D3	D4	Mean
M1	22.00	15.42	10.12	17.20	13.32	7.47	15.01	30.29	61.00	21.30
M3	19.88	13.90	8.68	15.21	11.68	6.56	13.00	25.96	52.12	18.55
M3	17.92	11.87	7.24	13.42	9.81	5.49	10.82	22.15	45.98	16.00
S1				22.40	17.46	7.50	15.15	29.98	58.32	25.13
S2				15.58	42.00	6.51	13.12	26.14	51.98	20.89
S3				10.15	7.46	5.43	11.00	21.92	44.02	16.68
P1						7.42	15.11	30.17	60.84	28.39
P2						5.47	10.98	23.02	46.09	21.39
Mean	19.93	13.73	8.68	15.66	11.96	6.48	13.02	26.20	52.54	21.04

TABLE-13 (B) MSPD MEANS FOR YEAST AND MOULDS COUNT/GM OF LAL PERA.

		P1				P2			
		D1	D2	D3	D4	D1	D2	D3	D4
M1	S1	9.50	23.56	60.00	150.24	7.78	18.54	48.00	120.16
	S2	8.54	17.00	34.02	70.24	6.58	13.02	26.22	53.02
	S3	7.56	12.00	16.99	24.02	5.59	8.40	12.30	19.14
M2	S1	8.64	21.42	54.17	140.12	6.80	16.40	40.98	102.85
	S2	7.62	15.23	31.21	62.00	6.02	12.00	23.97	48.34
	S3	6.21	9.42	15.00	21.08	4.66	7.12	11.02	16.50
M3	S1	7.82	19.52	51.32	126.57	5.50	14.32	36.11	90.42
	S2	6.56	13.08	26.12	51.98	4.50	9.18	19.00	35.98
	S3	5.69	8.68	12.88	19.33	3.52	5.25	8.54	13.14

ABBREVIATIONS

M1= BUFFALO MILK
M2= COW MILK
M3= TONED MILK

S1= 25% SUGAR
S2= 30% SUGAR
S3= 35% SUGAR

P1= POLYTHINE PACK.
P2= PARCHMENT PAPER PACK.

TABLE-13 (C) ANOVA TABLE FOR TOTAL PLATE COUNT / GM

S.v.	D.f.	SS	MSS	F.Cal
M	2	1969.2821	984.6411	4.95.89 **
S	2	52703.7156	26351.8578	13271.48 **
P	1	3613.0242	3613.0242	1819.61 **
D	3	108823.4027	36274.4676	18268.77 **
MxS	4	330.0831	82.5208	41.56 **
MxP	2	6.6119	3.3096	1.67 NS
MxD	6	1142.3255	190.3876	95.88 **
SxP	2	948.9804	474.4902	238.96 **
SxD	6	58506.6680	9751.1113	4910.91 **
PxD	3	2194.5331	731.5110	368.41 **
MxSxp	4	1105.3345	276.3336	139.17 NS
SxPxD	6	2505.3458	417.5576	210.29 **
MxPxD	6	2598.8674	432.6446	217.89 **
MxSxPxD	12	3209.3257	267.4438	134.69 **
Error	156	309.7536	1.9856	--

SE (M) SE (D) AND CD. TABLE

	M	S	P	D	MxS	MxP	MxD	SxP
SE(m)	0.1661	0.1661	0.1356	0.1917	0.2876	0.2348	0.3321	0.2348
SE(d)	0.2348	0.2348	0.1917	0.22711	0.4067	0.3321	0.4696	0.3321
CD(5%)	0.4602	0.4602	0.3758	0.5314	0.7972	0.6509	0.9205	0.6509

	SxD	PxD	MxSxP	SxPxD	MxPxD	MxSxPxD
SE(m)	0.3321	0.2712	0.2876	0.4697	0.4697	0.8135
SE(d)	0.4696	0.3834	0.4067	0.6642	0.6642	1.1504
CD(5%)	0.9205	0.7516	0.7972	1.3017	1.3017	2.2547

FIG.-13 EFFECT OF TYPES OF MILK, LEVELS OF SUGAR,
PACKAGING MATERIALS, AND PERIODS OF STORAGE
ON THE YEAST AND MOULDS COUNT/GM OF LAL PERA.

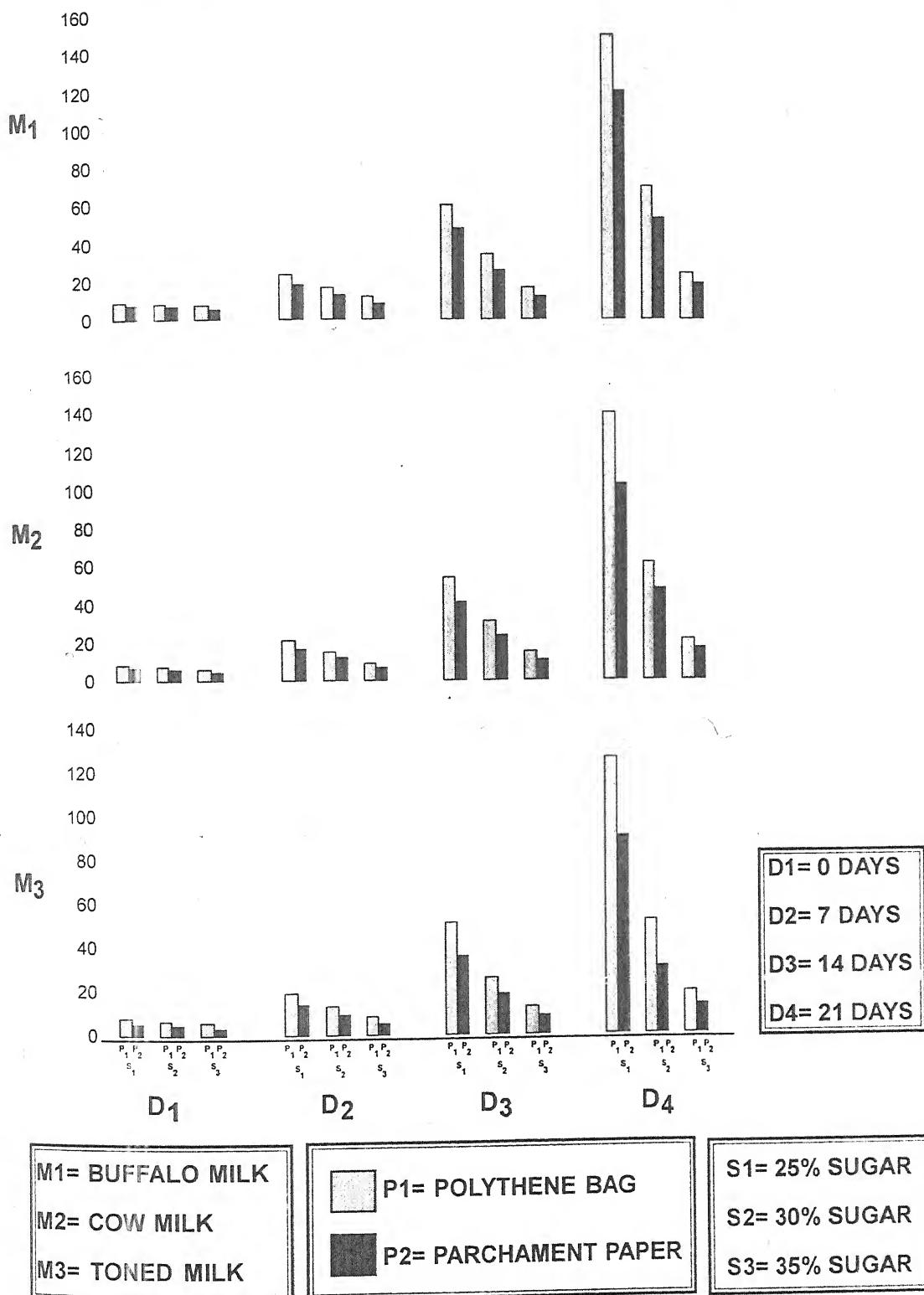


PLATE NO.- 1

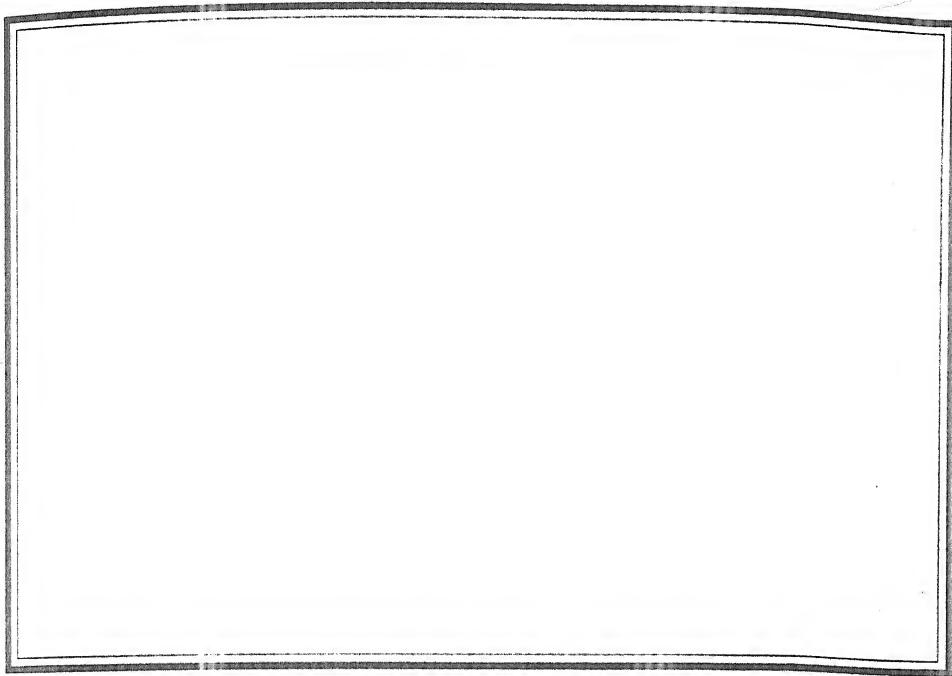
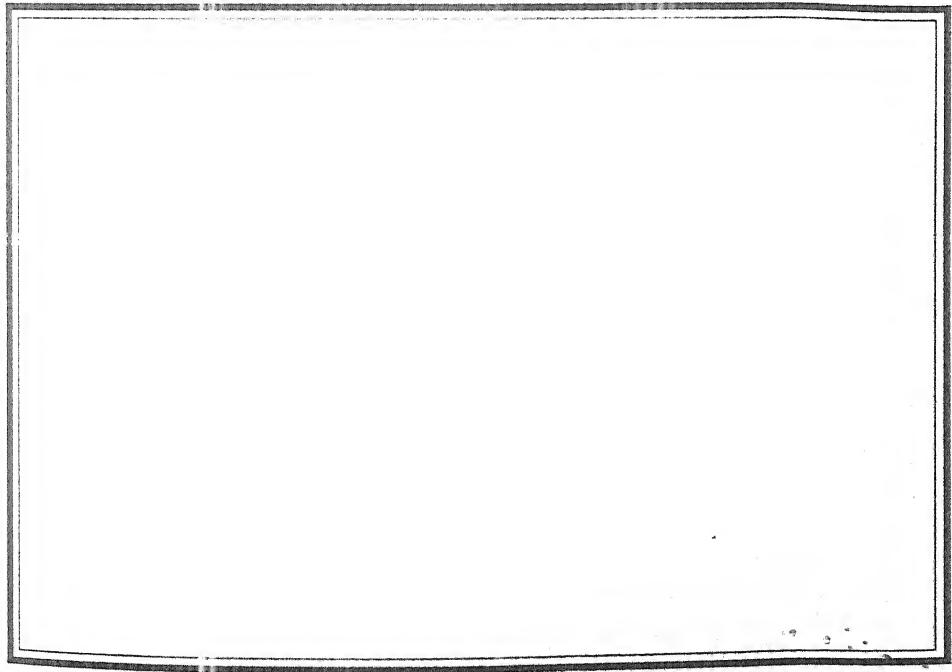


PLATE NO.- 2



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C- COLIFORMS COUNT/GM:

The coliforms bacterial contamination was not detected in any samples of Lal pera made from buffalo, cow and Toned milk khoa.

The results of the present findings are similar with the results of Kamat and Sulebele (1974) who reported that coliforms bacteria could not be detected in Lal pera samples, while the results obtained did not agree with the findings of Ghodekar et al. (1974), Singh et al. (1975) Dwarkanath and Srikanta (1977) and Garg and Mandokhot (1984) who detected and counted higher number of coliforms bacteria in pera samples obtained from different parts of the country.

5. ASSESSMENT OF THE COST AND PROFIT OF LAL PERA:

A- COST OF PRODUCTION PER KG. :

The comparison of the different combinations with respect to cost of production per kg (Rs) of Lal pera were presented in Table 14-A and 14-B and also illustrated in Fig. 14.

From Table 14-A it was observed that the lowest cost of production per kg (Rs. 90.57) was in case of Lal pera made from Toned milk khoa and the highest cost of production per kg (Rs. 92.85) was in case of Lal pera made from buffalo milk khoa.

So far as the sugar level is concerned the lower cost of production per kg of Lal pera (Rs. 90.86) was in case of 35% sugar, while in case of 30% and 25% sugar the cost of production per kg (Rs) was significantly higher to that of 35% sugar level.

Sugar is cheapest source of solids in comparison of khoa. Therefore, lowest cost of production per kg was found when the pera samples

containing 35% sugar and highest cost of production per kg of pera was noted as the sugar level decreasesd (30% and 25%).

Among the packaging materials significantly lowest cost of production per kg (Rs. 91.44) was observed with polythine pack than parchment paper pack.

From Table 14-B it is evident that the lowest cost of production per kg of lal pera (Rs 89.63) was in case of lal pera made from Toned milk khoa having 35% sugar with polythene pack. However all other treated samples showed non-significant differncests among themselves.

From Table 14-C showing analysis of variance of the cost of production per kg(Rs) of the different treatment combinations, it was observed that there were highly significant differences among the types of milk (M) levels of sugar (S) and packaging materials (P) All the treatment combinations deffered significantly at 0.1% level of significance. While all the interactions were found to be non significant

The findings led to the conclusion that low cost of production per kg could be obtained when the lal pera were made from toned milk khoa having 35% sugar with polythene pack.

TABLE 14A: EFFECT OF TYPES OF MILK, LEVELS OF SUGAR, AND PACKAGING MATERIALS ON THE COST OF PRODUCTION/KG OF LAL PERA.

	S1	S2	S3	P1	P2	Mean
M1	93.87	92.81	91.88	92.55	93.15	92.85
M2	93.06	92.14	90.93	91.5	92.58	92.04
M3	91.33	90.46	89.77	90.27	90.76	90.51
S1				92.43	93.07	93.15
S2				91.48	92.13	91.8
S3				90.42	91.29	90.86
Mean	92.75	91.8	90.8	91.44	92.43	GM=91.80

	M	S	P	MxS	MxP	SxP
S.E. (diff.)	0.47	0.47	0.39	0.82	0.67	0.69
C.D. at 5%	0.96	0.96	0.78	NS	NS	NS

TABLE 14B: MEAN FOR COST OF PRODUCTION/KG OF PERA.

	S1		S2		S3	
	S1	S2	P1	P2	P1	P2
M1	93.54	94.20	92.50	93.13	91.61	92.54
M2	92.73	93.39	91.75	92.59	90.01	91.84
M3	91.03	91.63	90.17	90.76	89.43	89.91

C.D. at 5% NS

ABBREVIATIONS

M1= BUFFALO MILK
M2= COW MILK
M3= TONED MILK

S1=25% SUGAR
S2= 30% SUGAR
S3= 35% SUGAR

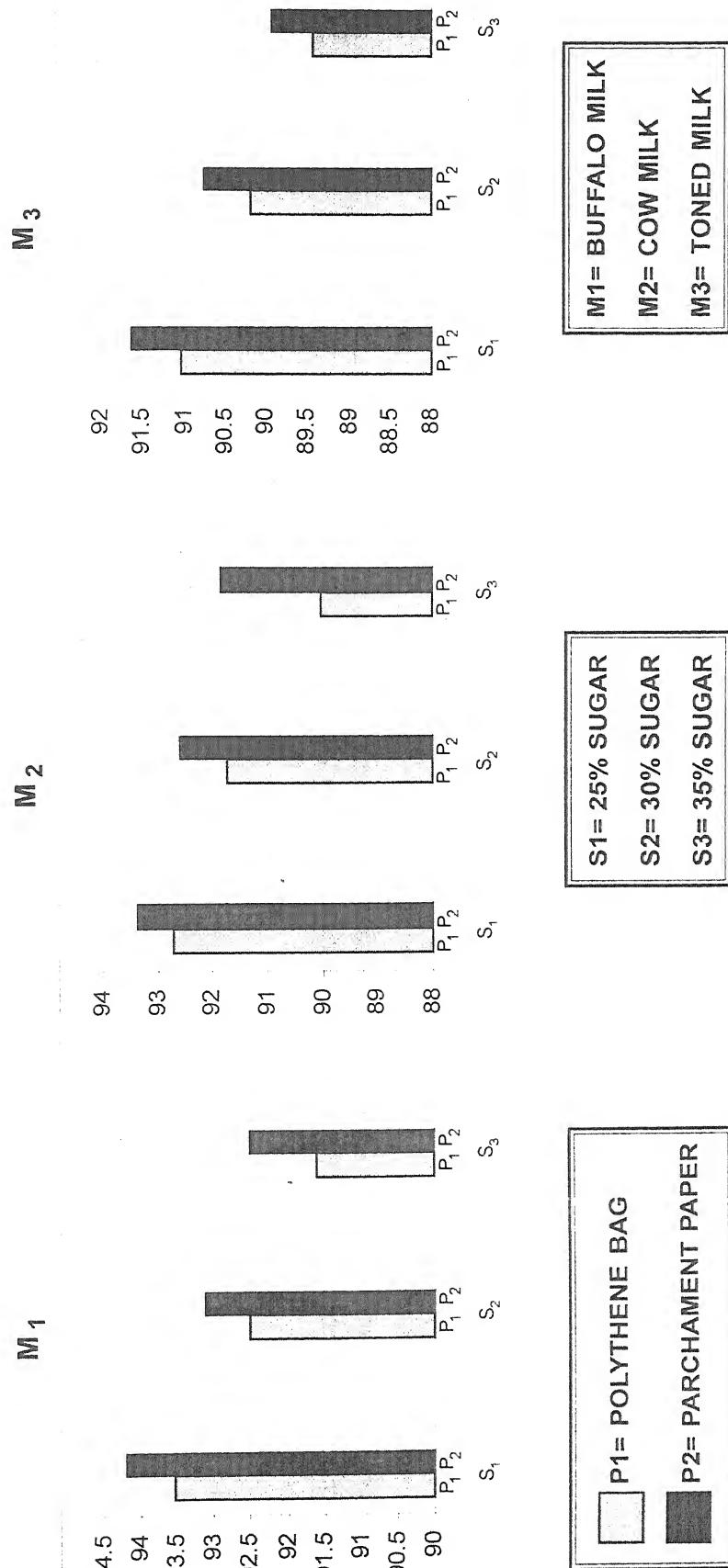
P1=POLYTHINE PACK.
P2= PARCHAMENT PAPER PACK.

TABLE 14C: ANALYSIS OF VARIANCE FOR COST OF PRODUCTION/KG OF PERA.

Source	D.F.	M.S.S.	F	C.D.
Treatment	17	5.453	2.749	***
	2	25.1933	12.49	0.96
Source	2	16.1596	8.01	***
	1	7.0996	3.52	0.784
D	4	0.1652	0.08	
M _S	2	0.4447	0.22	
M _{xP}	2	0.0778	0.04	
S _{xP}	4	0.2975	0.15	
M _{SxP}	36	2.0166		
Error	53	3.1188		
Total				

*** Significant at 0.1% level of significance.

FIG.-14 EFFECT OF TYPES OF MILK, LEVELS OF SUGAR AND PACKAGING MATERIALS ON COST OF PRODUCTION/KG OF LAL PERA.



B- PROFIT PER KG. :

The comparison of the different combinations with respect to profit and loss per kg (Rs) of lal pera has been presented in table 15-A and 15-B and also illustrated in fig. 15.

From Table 15-A it is evident that the highest profit per kg (Rs. 9.50) was in case of lal pera made from Toned milk khoa and the lowest profit per kg (Rs. 7.20 was) in case of lal pera made from buffalo milk khoa.

Since the cost of toned milk used for khoa making was lowest, it resulted into lower cost of lal pera per kg as compared to cow and buffalo milk, though the amount of toned milk required to produce one kg lal pera was higher but the total cost invested to prepare one kg. Pera was lower than the pera made from cow and buffalo milk khoa. Therefore, the profit per kg of pera made form toned milk khoa in the present investigation was found to be highest than pera made form Cow and buffalo milk khoa.

So far as the sugar level is concerned the higher profit per kg of lal pera (Rs. 9.01) was in case of 35% sugar while in case of 30% and 25% sugar the profit per kg (Rs) was significantly lower to that of 35% sugar.

Sugar is a cheapest source of solids in comparison to khoa, therefore highest profit per kg was found in case of pera containing 35% sugar and lowest profit per kg. pera was noted as the sugar level decreased (30% and 25%).

Among the packaging materials, significantly higher profit per kg

(Rs. 8.35) was observed in polythene pack than parchment paper pack (Rs. 7.66).

From Table 15-B it is clear that the highest profit per kg of pera (10.57) was in case of samples made from toned milk khoa having 35% sugar with polythene pack ($M_3S_3P_1$). However all other treatment showed non-significant differences.

From table 15-C showing the analysis of variance of the profit per kg (Rs) of the different treatment combinations, it was observed that there were highly significant differences among the types of milk (M) levels of sugar (S) and all the three treatment combinations varied significantly at 0.1% level of significance while all the interactions showed non significant differences.

The findings led to the conclusion that highest profit per kg could be obtained in case of lal pera made from toned milk khoa having 35% sugar with polythene pack.

TABLE 15A: EFFECT OF TYPES OF MILK LEVELS OF SUGAR AND PACKAGING MATERIALS ON THE PROFIT/KG OF LAL PERA.

	S1	S2	S3	P1	P2	Mean
M1	6.13	7.34	8.14	7.56	6.84	7.2
M2	6.94	7.83	8.57	8.17	7.39	7.78
M3	8.65	9.53	10.33	9.79	9.22	9.5
S1				7.57	6.61	7.24
S2				8.16	7.39	7.77
S3				9.32	8.7	9.01
Mean	7.24	7.77	9.01	8.35	7.66	Gm=8.16

TABLE 15B: ABC MEANS PROFIT/KG OF PERA.

	P1	P2	P1	P2	P1	P2
M1	6.46	5.8	7.27	6.61	8.97	8.33
M2	7.8	6.88	8.25	7.41	9.83	9.24
M3	8.42	7.86	8.98	8.16	10.57	10.09

ABBREVIATIONS

M1= BUFFALO MILK
 M2= COW MILK
 M3= TONED MILK

S1=25% SUGAR
 S2=30% SUGAR
 S3=35% SUGAR

P1=POLYTHINE PACK.
 P2=PARCHAMENT PAPER PACK.

MxSxP
 0.201
 NS

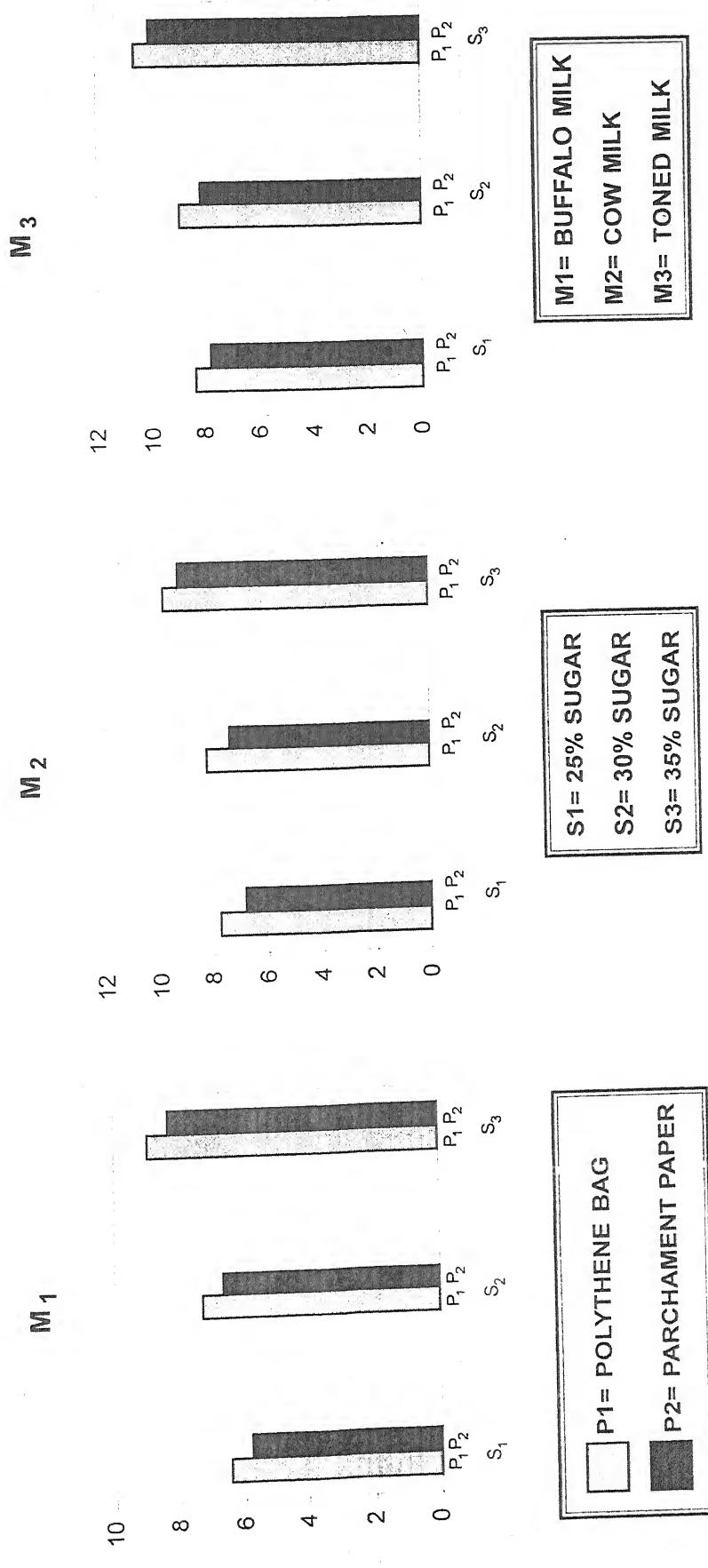
S.E. (diff)
 C.D. at 5%

TABLE 15C: ANALYSIS OF VARIANCE FOR PROFIT/KG OF PERA.

Source	D.F.	M.S.S.	F	C.D.
Treatment	17	5.1173	84.4444	
M	2	25.8444	426.62 ***	0.166
Source	2	14.2032	234.45 ***	0.166
P	1	6.3311	104.51 ***	0.136
MxS	4	0.0791	1.31	
MxP	2	0.0503	0.83	
SxP	2	0.0338	0.56	
MxSxP	4	0.021	0.35	
Error	36	0.00606		
Total	53	1.6825		

*** significant at 1% level of significance.

FIG.-15 EFFECT OF TYPES OF MILK, LEVELS OF SUGAR AND PACKAGING MATERIALS ON PROFIT/KG OF LAL PERA.



SUMMARY & CONCLUSION

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SUMMARY AND CONCLUSION

The present investigation "Technological studies and shelf life of Lal pera prepared from different types of milk". was carried out in the Department of A.H. and Dairying B.N.V. College, Rath and Department of A.H. and dairying C.S.A. University of Ag. and Tech. Kanpur . The lal pera was prepared from standardized milk of buffalo (6% Fat), Cow milk (4% Fat) and toned milk (3% Fat). The three levels of cane sugar used i.e. 25%, 30%, and 35% of the khoa weight. The lal pera prepared was analysed for organoleptic qualities, Yield, total solids, protein, fat, sucrose, ash, total plate count, yeast and mould count, coliforms count and the assessment of the cost and profit. The observations regarding organoleptic qualities, chemical characteristics and microbial qualities of lal pera were also recorded for fresh and stored samples (7days, 14 days and 21 days) at room temperatures. The cost of manufacture and profit of lal pera were calculated for fresh lal pera only.

A- YIELD :

- 1- The highest yield (26.18%) was in case of Lal Pera made from buffalo milk khoa and lowest yield (20.30%) was in case of Pera

after that the flavour score significantly decreased with the increase in periods of storage at room temperature.

- 5- The highest flavour score (43.60) was in case of fresh lal pera made from buffalo milk khoa having 35% sugar in parchment paper pack.
- 6- Statistically highly significant differences were observed among the types of milk, levels of sugar and packaging materials.

C- BODY AND TEXTURE SCORE :

- 1- The highest body and texture scores (20.87) was in case of Lal pera made from buffalo milk khoa and the lowest score (18.26) in case of lal pera made from toned milk Khoa.
- 2- The highest body and texture score (20.14) was noted with 35% sugar, while in case of 25% and 30% levels of sugar the body and texture scores were significantly lower.
- 3- Among the packing materials, a significantly higher score for body & texture (20.87) was observed in polythen than parchment paper (20.63).
- 4- As regards the periods of storage, it was observed that the highest score for body and texture (20.61) was when it was fresh. After that the quality deteriorated significantly with increasing periods of storage at room temperature.
- 5- Statistically highly significant differences were observed among the types of milk, levels of sugar and packaging materials.

D- COLOUR AND APPEARANCE SCORE :

- 1- The highest score for colour and appearance (87.69) was in case

of Lal pera made from buffalo milk khoa and the lowest (7.68) made from toned milk khoa.

- 2- As for as, the sugar level is concerned, the highest score of colour and appearance (8.66) was found with 35% sugar, while 25% and 30% levels showed nearly similar score of colour and appearance but which were significantly lower to that of 35% level of sugar.
- 3- Among the packaging materials, polythene packs showed significantly higher score (7.97) for colour and appearance than parchment paper (7.44).
- 4- As regards the periods of storage, higher score for colour and appearance (8.60) was observed when it was fresh. after that the colour and appearance scores decreased with the increasing period of storage at room temperature.
- 5- The fresh lal pera had good colour and score when it was prepared from buffalo milk khoa having 35% sugar with polythene packs.
- 6- Statistically highly significant differences were observed among the types of milk, level of sugar and packaging materials .

E- SWEETNESS SCORE :

- 1- The highest score for sweetness (6.72) was in case of pera made from buffalo milk khoa and the lowest score (6.17) was in case of pera made from cow milk khoa.
- 2- The highest score of sweetness (7.37) was in case of 35% sugar, while in case of 25% and 30% level of sugar the sweetness score

was significantly lower to that of 35% sugar.

- 3- Among the packaging materials, a significantly higher score for sweetness (6.72) was observed in polythene than parchment paper (6.24).
4. Highest sweetness score was found in fresh lal pera than longer storage at room temperature
5. Means of types of milk and periods of storage (SP) packing materials, it was found that the highest score for sweetness (7.59) was with 35% sugar level in the polythene packing.
- 6- Statistically highly significant differences were observed among the types of milk level of sugar and packaging materials .

F- OVERALL ORGANOLEPTIC SCORE :

- 1- The highest overall organoleptice score (78.82) was in case of Lal pera made from buffalo milk khoa and the lowest from toned milk khoa.
- 2- As for as ,the sugar level in concerned the highest overall organoleptic score lal pera (77.24) was in case of 35% sugar and the overall organoleptic quality was significantly inferior to that of 35% level of sugar .
- 3- Among the packing materials also a significantly higher score for overall organeleptic quality was observed in polythene pack (77.71) than parchment paper (76.31).
- 4- As regards the periods of storage, of Lal pera a highest overall organoleptice score (79.75) was noted when it was fresh. After that the overall organoleptic quality significantly deterioated with

the increasing periods of storage at room temperature.

- 5- The fresh Lal pera of good over all organoleptic quality can be made from buffalo milk khoa with 35% sugar packed in polythene.
- 6- Statistically highly significant differences were observed among the types of milk, level of sugar and packaging materials .

G- TOTAL SOLIDS CONTENTS (%) :

- 1- The highest total solids content (86.35 %) was in case of Lal pera made of cow milk Khoa and the lowest (84.74 %) from buffalo milk Khoa.
- 2- The highest total solids content (87.88 %) were obtained from 35 % sugar level, while 30 % and 25 % sugar were observed to be significantly lower as compared to 35 % level of sugar.
- 3- The impact of packaging material on total solids content (%) was evident by higher total solids content (%) in sample packed in the parchment paper. A higher total solids content (88.19%) was observed when the samples were packed in parchment paper than polythene pack.
- 4- As regards the periods of storage a lowest total solids (38.38%) were noted when the samples were tested fresh. A significant increase in total solids content (%) was observed as the storage period increased .
- 5- That higher total solids content (%) in Lal pera samples were obtained when it was prepared from buffalo milk, mixed with 35% sugar packed in parchment paper and stored for 21 days at room temperature.

6- Statistically highly significant differences were observed among the types of milk, level of sugar and packaging materials .

H- PROTEIN CONTENT (%) :

- 1- The highest protein content (15.12%) was in case of Lal pera made from cow milk khoa and the lowest (14.53%) from buffalo milk Khoa.
- 2- The impact of sugar levels shows that higher protein content (15.95%) were observed when the samples contained 25% sugar. The protein content was significantly lower in pera samples having 30% and 35% sugar levels as compared to 25% sugar level.
- 3- Among the packaging materials, significantly higher protein content (15.13%) was observed when packed in parchment paper than in polythene pack (14.68 %).
- 4- Lowest protein content (14.41%) was noted when it was fresh. after that the protein content (%) significantly increased with the increasing periods of storage due to evaporation of moisture at room temperature.
- 5- The highest protein content (%) could be obtained in case of Lal pera samples made cow milk Khoa having 25% sugar with polythene pack and stored for 21 days at room temperature.
- 6- Statistically highly significant differences were observed among the types of milk, level of sugar and packaging materials .

I- FAT CONTENT (%) :

- 1- The highest fat content (22.40%) was in case of Lal pera made from buffalo milk Khoa and the lowest (14.73%) from toned milk

Khoa.

- 2- The highest fat content (22.00%) was observed in case of 25% level, while in the sample containing 30% and 35% levels of sugar, the fat content (%) was significantly lower to that of 25% level of sugar.
- 3- Among the packaging materials a significantly higher fat content was observed in parchment paper(18.75%) than polythene pack (18.07%).
- 4- As regards the periods of storage the lowest fat content (17.93%) was when it was fresh. The fat content (%) significantly increased with periods of storage due to evaporation of moisture at room temperature.
- 5- A higher fat content (%) could be obtained in lal pera samples made from buffalo milk Khoa having 25% sugar with polythene packing and stored for 21 days at room temperature.
- 6- Statistically highly significant differences were observed among the types of milk, level of sugar and packaging materials .

J- SUCROSE CONTENT (%) :

- 1- The highest sucrose content (27.30%) was in case of lal pera made from toned milk Khoa and lowest (26.72%) from buffalo milk Khoa.
- 2- The highest sucrose content (32.67%) was formed in samples having 35% sugar while 30% and 25% levels of sugar showed significantly lower sucrose content as compared to 35 % level of sugar.

- 3- Among the packaging material, significantly higher sucrose content in lal pera (27.40%) was observed in the parchment paper than in the polythene pack (26.48%).
- 4- As regards the periods of storage, the lowest sucrose content (26.76) was noted when it was fresh.
- 5- The highest sucrose content (%) was found in lal pera samples made from toned milk khoa having 35% sugar the parchment paper and stored for 21 days at room temperature .
- 6- Statistically highly significant differences were observed among the types of milk, levels of sugar and packaging materials .

K- ASH CONTENT (%):

- 1- The highest ash content (3.15%) was in case of lal pera made from toned milk khoa and the lowest (2.84%) from buffalo milk khoa.
- 2- The highest ash content (3.19%) was noted with 25% sugar level, while 30% and 35% levels of sugar contained significantly lower ash content than 25% level of sugar .
- 3- A significantly higher ash content (3.14%) for pera samples was observed with parchment paper pack than polythene pack (2.96%).
- 4- The lowest ash contents (3.00%) was noted when the samples were fresh . The ash content (%) significantly increased with the increasing periods of storage due to evaporation of moisture at room temperature.
- 5- A highest ash content (%) may be obtained in pera samples made

from toned milk khoa having 25% with parchment paper pack and stored for 21 days at room temperature.

- 6- Statistically highly significant differences were observed among the types of milk, levels of sugar and packaging materials .

L- TOTAL PLATE COUNT/GM:

- 1- The lowest total plate count (37602/gm) was in case of lal pera made from Toned milk khoa and the highest (3685/gm) from buffalo milk khoa.
- 2- The lowest total plate count (38599.gm) was in case of 35% sugar level, while in case of 30% and 25% levels of sugar the total plate count/gm was significantly higher than that of 35% level of sugar.
- 3- A significantly lower total plate count (51030/gm) was observed with parchment paper than polythene pack (56194/gm)
- 4- As regards the periods of storage of lal pera, the lowest total plate count (13824/gm) was found when it was fresh .
- 5- The lowest standard plat count/gm was obtained in fresh lal pera made from toned milk khoa having 35 sugar with parchment paper pack.
- 6- Statistically highly significant differences were observed among the types of milk, levels of sugar and packaging materials .

M- YEASTS AND MOULDS COUNT/GM:

- 1- The lowest yeasts and moulds count (16.00/gm) was in case of lal pera made form toned milk khoa and the highest (21.30/gm) form buffalo milk khoa.
- 2- So for as the sugar level is concerned the lowest yeastes and

from toned milk khoa having 25% with parchment paper pack and stored for 21 days at room temperature.

- 6- Statistically highly significant differences were observed among the types of milk, levels of sugar and packaging materials .

L- TOTAL PLATE COUNT/GM:

- 1- The lowest total plate count (37602/gm) was in case of lal pera made from Toned milk khoa and the highest (3685/gm) from buffalo milk khoa.
- 2- The lowest total plate count (38599.gm) was in case of 35% sugar level, while in case of 30% and 25% levels of sugar the total plate count/gm was significantly higher than that of 35% level of sugar.
- 3- A significantly lower total plate count (51030/gm) was observed with parchment paper than polythene pack (56194/gm)
- 4- As regards the periods of storage of lal pera, the lowest total plate count (13824/gm) was found when it was fresh .
- 5- The lowest standard plat count/gm was obtained in fresh lal pera made from toned milk khoa having 35 sugar with parchment paper pack.
- 6- Statistically highly significant differences were observed among the types of milk, levels of sugar and packaging materials .

M- YEASTS AND MOULDS COUNT/GM:

- 1- The lowest yeasts and moulds count (16.00/gm) was in case of lal pera made form toned milk khoa and the highest (21.30/gm) form buffalo milk khoa.
- 2- So far as the sugar level is concerned the lowest yeastes and

moulds count (16.68/gm) were observed with 35% sugar level. while in case of samples having 30% and 25% levels of sugar the yeasts and moulds count/gm were significantly higher than that at 35% level of sugar .

- 3- A significantly lower yeasts and moulds count (21.39/gm) was observed with parchment paper than polythene.
- 4- The lowest yeasts and moulds count (5.47) was found when the samples were fresh. The count/gm increased significantly with the increasing periods of storage at room temperature.
- 5- The lowest yeasts and moulds count/gm was found in fresh pera made from Toned milk khoa having 35% sugar with parchment paper pack .
- 6- Statistically highly significant differences were observed among the types of milk, levels of sugar and packaging materials .

N- COLIFORMS COUNT /GM:

The coliforms bacterial contamination was not detected in any samples of lal pera prepared from buffalo , cow and toned milk khoa, perhaps due to higenic condition of the laboratory.

O- COST OF PRODUCTION PER KG.:

- 1- The lowest cost of production per kg (Rs.40.51) was in case of lal pera made from Toned milk khoa and the highest (Rs.42.85) from buffalo milk khoa.
- 2- A lower cost of production per kg of lal pera (Rs. 40.86) was in case of 35% sugar level, while in case of 30% and 25% levels of sugar the cost of production per kg(Rs) was significantly higher

to that of 35% sugar level.

- 3- A significantly lowest cost of production per kg (Rs. 41.44) was observed with polythine pack than parchment paper pack.
- 4- The lowest cost of production per kg could be obtained than lal pera made from toned milk khoa having 35% sugar with polythene pack .
- 5- Statistically highly significant differences were observed among the types of milk, levels of sugar and packaging materials .

P- PROFIT PER KG.:

- 1- The highest profit per kg (Rs. 9.50) was in case of lal pera made from toned milk khoa and the lowest (Rs. 7.20) from buffalo milk khoa.
- 2- The higher profit per kg of lal pera (Rs. 9.01) was in case of 35% sugar which was significantly higher than other treatments.
- 3- A significantly higher profit per kg(Rs. 8.35) was observed in polythene pack than parchment paper pack (Rs. 7.66).
- 4- The highest profit per kg of pera (10.57) was in case of samples made from toned milk khoa having 35% sugar with polythene pack.
- 5- Statistically highly significant differences were observed among the types of milk, levels of sugar and packaging materials .

CONCLUSION :

The following conclusion were drawn form the present investigation:-

- 1- The highest yield (26.97%) was in case of Lal pera made from

buffalo milk Khoa having 35% sugar in the polythine packing

- 2- A fresh lal pera of good overall organoleptic quality can be made from buffalo milk khoa with 35% sugar and packed in polythene .
- 3- Overall chemical quality with regards to total solids content in lal pera made from cow milk khoa having 35% sugar packed in parchment paper was superior than other combinations. While the fat content (%) was highest in pera samples made from buffalo milk khoa with 25% sugar in prachment paper pack. The sucrose and ash content were found to be highest in toned milk khoa having 35% and 25 % sugar with parchment paper pack . The chemical quality of lal pera increased with increase in periods of storage at room temperature .
- 4- The lowest total plate count and yeasts and moulds count /gm, were in case of fresh lal pera made from toned milk khoa with 35% sugar packed in parchment paper. The count increased with increase in periods of storage at room tempreture . The coliforms bacteria were non dedected in any samples of lal pera.
- 5- The lowest cost of production per kg of lal pera was observed made from toned milk khoa having 35% sugar with polythene packs.
- 6- The highest profit per kg of lal pera was found in samples made from toned milk khoa with 35% sugar in polythene packs .

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APPENDICS

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APPENDICES

A-1. STANDARD SALINE SOLUTION :

Use: It was used for dilution of Lal Pera sampels.

Composition:

1. Common Salt - 9 gm
2. Distilled water - 1000 ml

Preparation: 9 gm of pure Sodium Chloride (NaCl) was dissolved in 1000 ml of distilled water and filled 99 ml in dilution bottles.

Sterilization: Autoclaved at 15 lbs pressure (121oc) per sq. inch for 15 minutes.

A-2. PLATE COUNT AGAR (HI MEDIA):

Use: This medium was used for enumeration of the total bacterial count per gm of lal pera

Comosition:

Yeast extract	25 gm
Tryptone	5 gm
Dextrose	1 gm
Agar	15 gm
PH(Approx.)	7 \pm 0.2

Preparation: To rehydrate this medium 23.5 was suspended in 1000 ml distilled water. Heated to boiling to dissolve the medium completely. Sterilized by autoclaving at 15 lb pressure (121oc) for 15 minutes. Mixed well before puring into the petri-dishes.

(Chalmer's 1955)

A-3. Mac CONKEY BILE SALT AGAR (HI MEDIA)

Use : This medium was used for the enumeration of the total number of coliforms organisns per gm of lal pera.

Composition :

Peptone	17 gm
Proteosepeptone	3 gm
Lactose	10 gm
Bile salt	1.5 gm
sodium chloride	5 gm
Netural red	0.03 gm
Agar	15 gm
Crystalviolet	0.001 gm
Ph (Approx.)	7.1 ± 0.2

Preparation: To rehydrate this medium 51.1 gm was suspended in 100 ml of distilled water. Heated to boiling to dissolve the medium completely sterilized by auto-claving at 15 lbs pressure (121oc) for 15 minutes. Mixed well before pouring in to the petri-dishes.(Chalmer's 1955)

A-4. POTATO DEXTROSE AGAR (HI MEDIA) :

Use : This medium was used for the enumeration of yeasts and

moulds present per g of Pera.

Composition

Potatoes infusion form	200 gm
Dextrose	20 gm
Agar	15 gm
pH (Approx)	5.6 \pm 0.2

Preparation : To rehydrate this medium 39 gm was suspended in 1000 ml distilled water. Heated to boiling to dissolve the medium completely and sterilized by auto claving at 15 pounds pressure (121^0C) for 15 minutes. Mixed well before pouring into the petridishes.
(Chalmer's, 1955)

A-5. RECOMMENDED INCUBATION TEMPERATURE AND TIME FOR DIFFERENT GROUPS OF ORGANISM

Groups	Temp.	Time
Total plate count	$370\text{C}+10\text{C}$	48 hours
Coliforms organism count	$370\text{C}+10\text{C}$	48 hours
Yeasts and moulds count	$220\text{C}+10\text{C}$	3-5 days

A-1 Cost of production and profit per kg of Lal Pera made from buffalo milk Khoa with 25% sugar in the polythene pack.

Particulars	Quantity	Rate	Amount
Milk	3.949 kg	14.00/kg	55.28
Sugar	210gm	.016/gm	3.36
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	Polythene	.40	.40
Misc. Charge		2.00	2.00
Total production cost			93.54
Sale Cost			100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 93.54 =		

A-2 Cost of production and profit per kg of Lal Pera made from buffalo milk Khoa with 25% sugar in the Parchment paper.

Particulars	Quantity	Rate	Amount
Milk	3.949 kg	14.00/kg	55.28
Sugar	210gm	.016/gm	3.36
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	Parchment	1.06	1.06
Misc. Charge		2.00	2.00
Total production cost			94.20
Sale Cost			100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 94.20 =		

A-3 Cost of production and profit per kg of Lal Pera made from buffalo milk Khoa with 30% sugar in the Polythene pack.

Particulars	Quantity	Rate	Amount
Milk	3.79 kg	14.00/kg	53.06
Sugar	281gm	.016/gm	4.50
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	polythene	.40	.40
Misc. Charge		2.00	2.00
Total production cost			92.50
Sale Cost			100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 92.50 =		
	7.50		

A-4 Cost of production and profit per kg of Lal Pera made from buffalo milk Khoa with 30% sugar in the Parchment paper.

Particulars	Quantity	Rate	Amount
Milk	3.79 kg	14.00/kg	55.28
Sugar	210gm	.016/gm	3.36
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	Parchment	1.06	1.06
Misc. Charge		2.00	2.00
Total production cost			93.12
Sale Cost			100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 93.12 =		
	6.88		

A-5 Cost of production and profit per kg of Lal Pera made from buffalo milk Khoa with 35% sugar in the polythene pack.

Particulars	Quantity	Rate	Amount
Milk	3.72 kg	14.00/kg	51.51
Sugar	325 gm	.016/gm	5.20
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	polythene	.40	.40
Misc. Charge		2.00	2.00
Total production cost			91.61
Sale Cost			100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 91.61 =		
	8.39		

A-6 Cost of production and profit per kg of Lal Pera made from buffalo milk Khoa with 35% sugar in the Parchament paper.

Particulars	Quantity	Rate	Amount
Milk	3.67 kg	14.00/kg	51.38
Sugar	325 gm	.016/gm	5.20
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	parchment	1.06	1.06
Misc. Charge		2.00	2.00
Total production cost			92.54
Sale Cost			100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 92.54 =		
	7.86		

A-7 Cost of production and profit per kg of Lal Pera made from Cow milk

Khoa with 25% sugar in the Polythene pack.

Particulars	Quantity	Rate	Amount
Milk	4.736 kg	11.50/kg	54.464
Sugar	210gm	.016/gm	3.36
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	polythene	.40	.40
Misc. Charge		2.00	2.00
Total production cost			92.724
Sale Cost			100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 92.724 =		
	7.276		

A-8 Cost of production and profit per kg of Lal Pera made from Cow milk

Khoa with 25% sugar in the Parchment paper.

Particulars	Quantity	Rate	Amount
Milk	4.736 kg	11.50/kg	54.464
Sugar	210gm	.016/gm	3.36
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	parchment	1.06	1.06
Misc. Charge		2.00	2.00
Total production cost			93.384
Sale Cost			100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 93.384 =		
	6.616		

A-9 Cost of production and profit per kg of Lal Pera made from Cow milk Khoa with 30% sugar in the Polythene pack.

Particulars	Quantity	Rate	Amount
Milk	4.552 kg	11.50/kg	52.348
Sugar	281gm	.016/gm	4.50
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	polythene	.40	.40
Misc. Charge		2.00	2.00
Total production cost			91.748
Sale Cost			100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 91.748 =		
	8.25		

A-10 Cost of production and profit per kg of Lal Pera made from Cow milk Khoa with 30% sugar in the Parchment paper.

Particulars	Quantity	Rate	Amount
Milk	4.568 kg	11.50/kg	52.530
Sugar	210gm	.016/gm	4.50
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	parchment	1.06	1.06
Misc. Charge		2.00	2.00
Total production cost			92.59
Sale Cost			100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 92.59 =		
	7.41		

A-11 Cost of production and profit per kg of Lal Pera made from Cow milk Khoa with 35% sugar in the Polythene pack.

Particulars	Quantity	Rate	Amount
Milk	4.427 kg	11.50/kg	50.918
Sugar	325 gm	.016/gm	5.20
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	polythene	.40	.40
Misc. Charge		2.00	2.00
	Total production cost		91.016
	Sale Cost		100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 91.016 =		8.98

A-12 Cost of production and profit per kg of Lal Pera made from Cow milk Khoa with 35% sugar in the Parchament paper.

Particulars	Quantity	Rate	Amount
Milk	4.442 kg	11.50/kg	51.08
Sugar	325 gm	.016/gm	5.20
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	parchment	1.06	1.06
Misc. Charge		2.00	2.00
	Total production cost		91.84
	Sale Cost		100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 91.84 =		8.16

A-13 Cost of production and profit per kg of Lal Pera made from Toned milk Khoa with 25% sugar in the Polythene pack.

Particulars	Quantity	Rate	Amount
Milk	5.555 kg	9.50/kg	52.72
Sugar	210gm	.016/gm	3.36
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	polythene	.40	.40
Misc. Charge		2.00	2.00
Total production cost			91.03
Sale Cost			100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 91.03 =		
	8.97		

A-14 Cost of production and profit per kg of Lal Pera made from Toned milk Khoa with 25% sugar in the Parchment paper.

Particulars	Quantity	Rate	Amount
Milk	5.546 kg	9.50/kg	52.706
Sugar	210gm	.016/gm	3.36
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	polythene	1.06	1.06
Misc. Charge		2.00	2.00
Total production cost			91.628
Sale Cost			100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 91.628 =		
	8.372		

A-15 Cost of production and profit per kg of Lal Pera made from Toned milk Khoa with 30% sugar in the Polythene pack.

Particulars	Quantity	Rate	Amount
Milk	5.345 kg	9.50/kg	50.77
Sugar	281gm	.016/gm	4.50
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	polythene	.40	.40
Misc. Charge		2.00	2.00
	Total production cost		90.17
	Sale Cost		100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 90.17 =		9.83

A-16 Cost of production and profit per kg of Lal Pera made from Toned milk Khoa with 30% sugar in the Parchment paper.

Particulars	Quantity	Rate	Amount
Milk	5.337 kg	9.50/kg	50.701
Sugar	281gm	.016/gm	4.50
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	polythene	1.06	1.06
Misc. Charge		2.00	2.00
	Total production cost		90.761
	Sale Cost		100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 90.761 =		9.24

A-13 Cost of production and profit per kg of Lal Pera made from Toned milk Khoa with 25% sugar in the Polythene pack.

Particulars	Quantity	Rate	Amount
Milk	5.555 kg	9.50/kg	52.72
Sugar	210gm	.016/gm	3.36
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	polythene	.40	.40
Misc. Charge		2.00	2.00
Total production cost			91.03
Sale Cost			100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 91.03 =		
	8.97		

A-14 Cost of production and profit per kg of Lal Pera made from Toned milk Khoa with 25% sugar in the Parchment paper.

Particulars	Quantity	Rate	Amount
Milk	5.546 kg	9.50/kg	52.706
Sugar	210gm	.016/gm	3.36
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	polythene	1.06	1.06
Misc. Charge		2.00	2.00
Total production cost			91.628
Sale Cost			100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 91.628 =		
	8.372		

A-17 Cost of production and profit per kg of Lal Pera made from Toned milk Khoa with 35% sugar in the Polythene pack.

Particulars	Quantity	Rate	Amount
Milk	5.192 kg	9.50/kg	49.33
Sugar	325 gm	.016/gm	5.20
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	polythene	.40	.40
Misc. Charge		2.00	2.00
	Total production cost		89.43
	Sale Cost		100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 89.43 =		10.57

A-18 Cost of production and profit per kg of Lal Pera made from Toned milk Khoa with 35% sugar in the Parchment paper.

Particulars	Quantity	Rate	Amount
Milk	5.250 kg	9.50/kg	49.87
Sugar	280gm	.016/gm	4.48
Labour charge	4 hours	50/8 hours	25
Heating medium	3 hours	2.50 hour	7.50
Packaging material	polythene	1.06	1.06
Misc. Charge		2.00	2.00
	Total production cost		89.91
	Sale Cost		100.00
Net Profit (Rs/kg)=	Sale cost - Production Cost		
	100.00 - 89.91 =		10.09